

THE GRAMMAR OF QUANTIFICATION

by

ROBERT CARLEN MAY

B.A., Swarthmore College
(1973)

SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE
DEGREE OF

DOCTOR OF PHILOSOPHY

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

September 1977

Line February 1978

Signature of Author
Department of Linguistics and Philosophy
September 15, 1977

Certified by
Thesis Supervisor

Accepted by
Chairman, Departmental Committee on Graduate Students



THE GRAMMAR OF QUANTIFICATION

by

ROBERT CARLEN MAY

Submitted to the Department of Linguistics and Philosophy on
September 15, 1977 in partial fulfillment of the requirements for the degree
of Doctor of Philosophy.

ABSTRACT

This thesis represents an inquiry into aspects of the general theory of linguistic markedness as applied to natural language quantification. It seeks to develop a theory in which it is possible to distinguish, on the basis of universal grammatical principles, the unmarked cases of natural language quantification from the marked or idiosyncratic cases.

The central result is that the unmarked cases of quantification are represented by just those quantified structures which are well-formed at the linguistic level of Logical Form. We understand Logical Form to be the interface between a highly restricted theory of linguistic form and a more general theory of natural language semantics and pragmatics. It is argued that Logical Form is constructed by rules mapping from Surface Structure, which are formulated, as are the rules mapping from Deep to Surface Structure, with respect to restrictive parameters fixed by Universal Grammar. In particular, we propose a rule, QR, which generates representations at Logical Form for sentences containing quantifiers. Well-formedness of representations at this level is determined by universal principles on the output of the rules of core grammars; specifically, the Predication Condition, the Condition on Quantifier Binding and the Subjacency Condition are all argued to be general conditions on well-formed representations at Logical Form.

In Chapter One we develop the theory of grammar which we assume for the duration, and formulate QR within that theory. The functioning of this rule in single clause sentences containing quantifiers is discussed. Chapter Two is devoted to investigating the range of possible interpretations for sentences containing complex quantified noun phrases, e.g., PP-complements, relative clauses, partitives, nominalizations, etc. Chapter Three examines the range of possible interpretations of complex sentential structures. It is shown that it follows from the Subjacency Condition that quantification is clause bounded, in the unmarked case. The final chapter sketches a number of suggestions for an account of the marked cases of quantification.

Thesis Supervisor: Noam Chomsky
Title: Institute Professor

To my parents
with love

ACKNOWLEDGEMENTS

It is with great pleasure that I take this opportunity to thank those who have lent their advice, criticism and support to this enterprise. First and foremost, I would like to thank my advisor Noam Chomsky, whose profound influence is apparent throughout these investigations. I consider myself privileged to have worked with him on this dissertation. I also consider myself fortunate to have had an opportunity to work with Sylvain Bromberger, who has been a constant source of intellectual stimulation. As a member of my committee, he has devoted more time and energy to this dissertation than I had any reasonable right to expect. Thanks are also due to Joan Bresnan, the third member of my committee, for her far-reaching critical insights.

I am particularly indebted to Robert Freidin, whose penetrating criticisms have proved to be invaluable in the clarification and organization of my ideas. I have also profited from long discussions with Jacqueline Gueron, and from comments offered by Jean-Roger Vergnaud. Jon Allen afforded me a chance to present part of this material in a series of lectures to his class during the spring semester, 1977. Leland George and Pat Sullivan have kindly devoted their energies to providing editorial assistance.

In common with many others who have passed through the Linguistics Department, I would like to thank Morris Halle. I hope that the research presented in these pages begins to measure up to his unique standards for linguistic research.

My deepest thanks, however, are for Virginia Mann. It has been her kindness, warmth and love which have ultimately made the writing of this dissertation worthwhile. Indeed, the true situation is barely captured by saying that without her it would not have been possible to start, no less complete, this thesis.

TABLE OF CONTENTS

	<u>Page</u>
Abstract	2
Acknowledgements	4
INTRODUCTION	8
Chapter One: ON THE FORM AND FUNCTIONING OF QR	12
1.1 The range of grammatical theory	12
1.2 QR	18
1.3 The conditions on logical form	20
1.4 Simple sentential constructions	29
1.5 The marked case	34
1.6 On the insufficiency of surface structure	37
Footnotes	41
Chapter Two: QUANTIFIERS AND NOUN PHRASES	61
2.1 PP-complement constructions	61
2.2 Nominal structure and linked logical forms	65
2.3 Post-verbal NP-PP constructions	75
2.4 <u>Wh</u> -constructions	85
2.5 The marked case	100
2.6 Relative clause constructions	104
2.7 Possessives and Nominalizations	109
2.8 Partitive constructions	114
Appendix: On the Non-extendability of the A/A Condition	125
Footnotes	134

	<u>Page</u>
Chapter Three: QUANTIFIERS IN COMPLEX SENTENTIAL CONSTRUCTIONS	168
3.1 The Subjacency Condition	168
3.2 Matrix-Complement constructions	171
3.3 The Marked Case	177
3.4 Relative Clause constructions	180
3.5 Subjectless complement constructions	188
Appendix: On the Tensed-S and Specified Subject Conditions	205
Footnotes	208
Chapter Four: PROLEGOMENA TO AN ANALYSIS OF THE MARKED CASE	231
Footnotes	242
Bibliography	246

INTRODUCTION

Linguistics, as it is currently conceived, is fundamentally an epistemological inquiry. Its goal is to provide a formal characterization of our knowledge of language, which can play a part in explaining how children can learn language within a limited amount of time, from degenerate data. The goal of linguistic theory, then, is not simply to provide a characterization of our linguistic knowledge, i.e., to attain descriptive adequacy, but to provide one which helps explain how we come to have that knowledge, i.e., to attain explanatory adequacy. In order to accomplish this goal, a theory of grammar provides a set of universal principles, Universal Grammar, which characterizes that knowledge which the child brings to the language learning task as part of his natural human endowment. The central empirical task facing the linguist, then, is to correctly formulate Universal Grammar so that it is possible to distinguish, in any natural language, those grammatical phenomena which follow from universal principles from those which are idiosyncratic to particular languages.

In this thesis, the approach to be taken to this issue is essentially that of a theory of "markedness". In line with this approach, we assume that Universal Grammar specifies a (finite) set of general grammatical principles, and fixes a number of formal parameters limiting the range of possible rules available for grammars of particular languages. These principles, and those rules of particular languages which may be formulated within these parameters constitute the "core" grammars of these languages. Those structures which are generable by the core grammars of

particular languages are the "unmarked" cases; they are the structures generable in accordance with the principles of Universal Grammar.

Structures whose generation lies beyond the scope of core grammars are the "marked" cases; they represent the idiosyncratic, or accidental, aspects of particular languages. Thus, the distinction between the unmarked and marked cases in a language is ultimately the distinction between our universal linguistic knowledge and our particular linguistic knowledge. It is the difference between what we know of a language by virtue of being *Homo sapiens*, and what we know by virtue of being native speakers of one language rather than another.

The central hypothesis to be explored in this thesis is that the principles of Universal Grammar which characterize our universal knowledge of linguistic structure, determine not only what are possible syntactic forms of a language, but also what are possible "logical forms", in a technical sense of this term which will be developed below. We will argue that the same principles which determine the unmarked cases in syntax also determine the unmarked cases in semantics. That level of linguistic representation at which these principles are defined we shall call Logical Form, which we interpret as the interface of a more comprehensive theory of the semantics and pragmatics of natural language (Cf. Chomsky (1975a), (1977b)). Our main empirical interest, then, is in the nature of possible structures at this level, i.e., those structures which are generable by core grammars.

The particular structures at this level which will be our primary concern are those associated with sentences containing quantifiers; i.e.,

words like 'every', 'all', 'some', 'a', 'each', 'the', 'no', 'three', 'many', 'few', 'more', etc. What we will be endeavoring to show here is that the unmarked interpretation of sentences containing quantifiers (i.e., those interpretations which are universally present in quantified sentences of a given construction) are represented by just those (quantified) structures which are well-formed at the level of Logical Form, as determined by the principles of Universal Grammar. Thus, we wish to distinguish here what we know of the logical structure of sentences containing quantifiers by virtue of our universal linguistic knowledge, from that which we know by virtue of our knowledge of the particular language we happen to speak.

In investigating the issues just raised, we will essentially be assuming the organization of grammar depicted in (1):

$$(1) \quad DS \rightarrow SS \rightarrow LF$$

An organization of grammar along these lines has been assumed in a number of recent studies, for example Chomsky (1976), Fiengo (1977), Guéron (1977), Rouveret (1977), Sag (1976) and Williams (1977). Under this conception, rules which generate base (i.e., deep) structures, along with those rules which map from Deep Structure to Surface Structure, and from Surface Structure to Logical Form, constitute the rules of sentence grammar. Where we differ from others subscribing to this view of grammar is that we assume that all rules of sentence grammar (aside from base rules) are to be formulated as transformations. These rules, in conjunction with the

principles which determine the well-formedness of the structures which are the output of the rules of sentence grammar, constitute the core grammar of a language. It is the structures which are generated by the core grammars of languages which represent the unmarked cases. In Chapter One, we will examine the properties of the core grammar of English, and formulate a rule of sentence grammar which generates logical forms for sentences containing quantifiers. We will also begin to examine the properties of structures which are generated at the level of Logical Form, in particular, those associated with single clause sentences containing simple noun phrases. In Chapter Two, we extend the analysis to a range of sentences containing complex nominal constructions, such as PP-complement constructions, relative clauses, possessive noun phrases, nominalizations and partitives containing quantifiers. Chapter Three focuses on the structures associated with complex sentential constructions. In the final chapter, we sketch an account of the marked interpretations of quantified sentences.

Chapter One: ON THE FORM AND FUNCTIONING OF QR

1.1 The range of grammatical theory. As was noted in the Introduction, the central hypothesis to be explored here is that the transformational rules of sentence grammar map not only deep structures onto surface structures, but also surface structures onto representations, as phrase markers, at the level of Logical Form. The purpose of this section is to make clear the notion of transformation we are employing in making this claim, in order that we may formulate a specific rule of sentence grammar generating representations at Logical Form for sentences containing quantifiers.

The rules of core grammar are of essentially two types: base rules and transformational rules. We assume that the base rules are given as a context-free rewriting grammar. In formulating transformational rules, we will follow suggestions in Chomsky (1976), (1977a) and Chomsky and Lasnik (1977), that Universal Grammar fixes a number of formal parameters, which have the effect of severely limiting the expressive power of the theory of transformations. In particular, it has been suggested that transformational rules be limited to mentioning only the type of operation they perform, perhaps limited to adjunction, movement and substitution, and the element which is affected by the rule. In general, this element can either be a phrase, e.g., NP, AP, etc., or a specifier of one of these phrase types, e.g., wh. These restrictive parameters have the effect of only permitting transformations to be stated in a maximally simple fashion, e.g., as "Move NP" or "Move wh". Notice, that excluded

from transformational formalism under these assumptions are such common formal devices as labelled brackets, essential syntactic variables and context elements. (For an explicit formalism incorporating a number of these restrictions, see Lasnik and Kupin (1976)).

One of the significant aspects of these restrictions on the formal expressive power of transformations is that they only allow the formulation of a finite class of rules from which the rules of core grammars of particular languages may be chosen. In this respect, Universal Grammar only provides a finite set of possible core grammars. Thus, in order to determine the core grammar of his or her language, the child need only consider a finite class of possibilities. Notice, that this theory, which distinguishes the universal, or unmarked cases in a language, from the idiosyncratic, or marked cases, on the basis of a core grammar allowed by this theory, provides a more structured evaluation metric than theories, such as that in Chomsky (1955), or more recently, Peters and Ritchie (1973), which place no formal bound on the length of structural descriptions. These latter theories, therefore, allow for the construction of an infinite class of possible grammars, with no principled dichotomy of unmarked-marked. The key empirical issue, then, is whether the theory of core grammar conforming to our restricted assumptions can correctly distinguish the unmarked from the marked case.

At first blush, this approach to the formulation of transformational rules may seem woefully impoverished. Consider the rule of wh-movement, stated in this theory as "Move wh". If taken literally, this would mean that only the wh-word is affected by the rule. It is a general property

of transformational rules, though, that they affect major lexical phrases; they never affect simply the specifier of those phrases.¹ Thus, wh-movement must be interpreted as affecting a phrase containing the specifier element. In order to guarantee that rules like wh-movement apply correctly, we will assume the following condition on the interpretation of rules mentioning specifier elements:²

Condition on Analyzability

If a rule ϕ mentions SPEC, then ϕ applies to the minimal $[+N]$ -phrase dominating SPEC, which is not immediately dominated by another $[+N]$ -phrase.

This condition, which is basically that proposed in Woisetschlaeger (1976), incorporates insights originally due to Ross (1967), (1974) concerning immediate domination. It also incorporates an insight due to Bresnan (1976a) that the key to accounting for the "left-branch" phenomena first discussed in Ross (1967), lies in the possibility of formulating, in the \bar{X} -theory of phrase structure proposed in Chomsky (1970), natural classes of syntactic categories. Under this theory, the major lexical and phrasal categories are projected from the universal set of category features, $\{+N, +V\}$. The phrases which have the value $[+N]$ as part of their feature specification are noun phrases and adjective phrases. Therefore, under the provisos of the Condition on Analyzability, if SPEC is wh, then wh-movement affects the minimal noun or adjective phrase, which is not immediately dominated by another noun or adjective phrase. Given this cross-categorial property of the Condition on Analyzability, consider the

examples in (1.1):

- (1.1)a How good a lawyer is Belli?
- b *How good is Belli a lawyer?
- c *How is Belli good a lawyer?

In the structure which underlies the examples in (1.1), which is essentially (1.2), the wh-word 'how' is dominated by an

- (1.2) [_SBelli is [_{NP}[_{AP}how good] a lawyer]]

AP, which is itself immediately dominated by an NP. By the Condition on Analyzability, wh-movement may only affect the dominating NP, since, while both it and the AP are [+N]-phrases, the NP is the only one which is not immediately dominated by another [+N]-phrase. The Condition on Analyzability, therefore, permits the generation of (1.1)a, but not of (1.1)b or (1.1)c.

Besides assuming that all transformational rules of sentence grammar are of the form just specified, we will also hold that they apply freely. By this is meant not only that transformations apply optionally, but that they are not subject to any constraints which would "block" their functioning in certain structures. Rather, we will hold that there is a limited set of conditions, specified by Universal Grammar, which determine whether the structures which are the output of the rules of sentence grammar are well-formed. This approach is made possible by assuming that movement rules function in accordance with the "trace theory

of movement rules", as discussed in Wasow (1972), Selkirk (1972), Fiengo (1974), (1977), Chomsky (1973), (1975a), (1976), (1977a) and Chomsky and Lasnik (1977). Under the tenets of this theory of movement rules, a moved phrase binds a "trace" at its extraction site, each phrase binding a distinct trace. The relationship of a phrase and the trace which it binds may be viewed as an instance of the bound anaphor-antecedent relationship, or, in the particular case which will interest us, the relationship between a quantifier and a bound variable.³ Given this parallelism, it is possible to treat the conditions which determine when the relationship between a phrase and its trace is well-formed as sub-cases of the universal conditions determining the general properties of anaphoric control. The particular conditions we have in mind have all been proposed in a number of places in the recent literature: The Predication Condition (Chomsky (1977b), Freidin (1977)), The Condition on Proper Binding (Fiengo (1974), (1977)), The Subjacency Condition (Chomsky (1971), (1973), (1975a), (1976), (1977a)) and The Tensed-S and Specified Subject Condition (Chomsky (1971), (1973), (1975a), (1976), (1977a), Kayne (1975), Quicoli (1977a), (1977b)).

While each of these conditions will, in turn, be discussed in greater detail, what is important to note here is that they are all construed as well-formedness conditions on the output of the rules of sentence grammar (Cf. Chomsky (1977a), Freidin (1977)). Since we are holding that the rules of sentence grammar encompass not only those rules, like wh-movement and NP-movement, which determine the syntactic structure of a sentence, but also those rules which determine its logical structure, it is natural to construe the conditions just enumerated as conditions on

well-formed representations at the level of Logical Form. Indeed, we may consider these conditions as part of the definition of the level of Logical Form. On our extended notion of sentence grammar, this result is a consequence of holding that the rules of sentence grammar carrying base structures into Logical Form are transformations, subject to a uniform set of conditions determining whether the structures derived by these rules are well-formed.

What we wish to show, then, is that under the assumptions we are making here, a set of rather diverse properties concerning the range of possible interpretations open to sentences containing quantifiers follow from independently motivated, universal conditions on the nature of possible structures generable by sentence grammar. Before beginning to examine this claim, though, let us summarize the assumptions presented in this section. First, it is being held that representations at Logical Form are phrase markers. Second, it is being held that the rules which map from Surface Structure to Logical Form are identical in form and functioning to rules mapping from Deep to Surface Structure. Finally, the structures derived by these rules are subject to a set of well-formedness conditions, stated at the level of Logical Form. Given these basic assumptions, what we will see is that the properties of the unmarked cases in semantics, i.e., those properties of a sentence's interpretation which are determinable solely from structural criteria, follow from the same set of universal conditions as unmarked cases in syntax. It is to examining the empirical content of the claim that the bulk of what follows is devoted.

1.2 QR. Given the conception of grammar just outlined, we are now in a position to formulate a rule of sentence grammar, mapping from Surface Structure to Logical Form, which generates logical forms for sentences containing quantifiers. This rule, which will henceforth be referred to as QR, may be formulated as in (1.3):

(1.3) Adjoin Q (to S)

In order to fully understand the functioning of this rule, there are a number of preliminary matters which need clarification. First of all, what is the status of the term Q in QR? We are assuming that there exists a phrase structure rule $NP \rightarrow SPEC(\bar{N}) - \bar{N}$, where 'SPEC(\bar{N})' may be realized either as Q, which ranges over quantifier elements such as 'every', 'some', 'a', 'many', 'three', etc., or as DET, which ranges over the definite determiner, demonstrative and reflexive pronouns, possessive noun phrases, etc.⁴ It may also be null, as in the case of proper names and personal pronouns. Thus, we are taking Q and DET to be category symbols, just as N, V, A, etc., are category symbols.⁵ QR applies only in those structures in which SPEC(\bar{N}) is realized as Q, in accordance with the provisions of the Condition on Analyzability.

Given this formulation of the nominal specifier system, we may distinguish between quantified expressions, i.e., where the specifier is a quantifier, and what we shall call "referring expressions", i.e., where the specifier is either a determiner or null. This distinction roughly mirrors the traditional logical distinction between terms and quantified

expressions.

We presume that QR, since it effects a movement of a noun phrase, obeys the trace theory of movement rules. In this case, we will construe the trace which arises from the functioning of QR as a variable bound by the moved quantifier.

As an example, consider the functioning of QR in a structure such as (1.4):

$$(1.4) \quad [S_i \text{ Cecil played } [_{NP} [Q \text{ every}] \text{ scale}]]$$

By virtue of the Condition on Analyzability, QR affects the noun phrase 'every scale', since it is the minimal [+N]-phrase dominating the quantifier 'every', adjoining it to S. This generates (1.5), as a representation at the level of Logical Form:

$$(1.5) \quad [S [_{NP} [Q \text{ every}] \text{ scale}]_{\alpha} [S_i \text{ Cecil played } \alpha]]$$

The occurrence of the variable ' α ' in S_i represents the variable bound by the quantifier; the other occurrence is simply an index, indicating the variable which is bound by this phrase. If a quantified noun phrase appears in subject position in surface structure, QR functions in quite parallel fashion: (1.7) is the structure at Logical Form which is generated by QR from the surface structure (1.6):⁶

$$(1.6) \quad [S_i [_{NP} [Q \text{ some}] \text{ body}] \text{ saw Dexter}]$$

$$(1.7) \quad [S_{NP[Q \text{ some}] \text{ body}]_{\alpha} [S_i^{\alpha} \text{ saw Dexter}]]$$

In what follows, we will refer to structures like (1.5) and (1.7), which are representations at the level of Logical Form, as "logical forms". Thus, we will be using this term in an ambiguous manner, to refer to both types and tokens. On the one hand, we will speak of a type of construction being related to a type of logical form. On the other, we will speak of a sentence, (i.e., an instance of a type of construction), being associated with a "logical form", (i.e., an instance of a type of logical form). As a further piece of nomenclature, we will refer to the "open" sentence which is most deeply embedded in a logical form as the "main predicate". Thus, in (1.5) and (1.7), the main predicate is S_i .

1.3 The conditions on Logical Form. Under the conception of the functioning of movement rules being assumed here, i.e., that they apply freely, in accordance with the trace theory of movement rules, it is necessary to distinguish the notion of a variable being "properly bound" from the simple notion of a variable being bound. This is because under trace theory every movement of a [+N]-phrase generates a structure containing a bound variable. Only certain of these structures, though, are well-formed. It is of central empirical importance, therefore, to be able to distinguish, on general principled grounds, those structures which represent the result of legitimate movements, (i.e., where a trace is properly bound), from those structures which represent the result of illegitimate movements, (i.e., where the trace is not properly bound). It

has been suggested, primarily in Fiengo (1974), (cf. also Chomsky (1975a)), that the appropriate fashion in which to characterize the conditions under which a phrase properly binds a variable is a generalization of the conditions governing anaphora. We assume, following Reinhart (1976), that these conditions are stated in terms of the notion "c-command", defined as follows:

A node ϕ c-commands a node ψ iff the first branching node dominating ϕ also dominates ψ and ϕ does not dominate ψ .

The chief insight afforded by the notion c-command is that it allows us to determine when a variable is properly bound solely from hierarchical sentential structure. Thus, taking the notion "variable" in a rather general sense, as including not only those variables which arise by virtue of the trace theory of movement rules (i.e., traces which arise from the functioning of rules like QR, NP-movement and wh-movement), but also anaphoric pronouns, reciprocals and the PRO element in structures of obligatory control, it is possible to formulate the notion of proper binding of variables as follows:

(1.8) A variable is properly bound by a binding phrase ϕ iff it is c-commanded by ϕ .

The notion of proper binding, in turn, allows us to formulate the following general principle on well-formed representations at the level of Logical Form:

Predication Condition

Every argument position of a predicate must either be a referring expression or a properly bound variable.

Where, in general, the argument positions of a predicate are its subject, and any other noun phrase for which it is subcategorized.⁷ (Cf. Chomsky (1977b), p. 10-11 and Freidin (1977) for discussion of conditions which are essentially the same as the Predication Condition.) Our particular interest in the Predication Condition will in the main center around a corollary of this condition, The Condition on Proper Binding,

Condition on Proper Binding

Every variable in an argument position of a predicate must be properly bound.

as well as with another, closely related condition, which we shall call The Condition on Quantifier Binding:

Condition on Quantifier Binding⁸

Every quantified phrase must properly bind a variable.

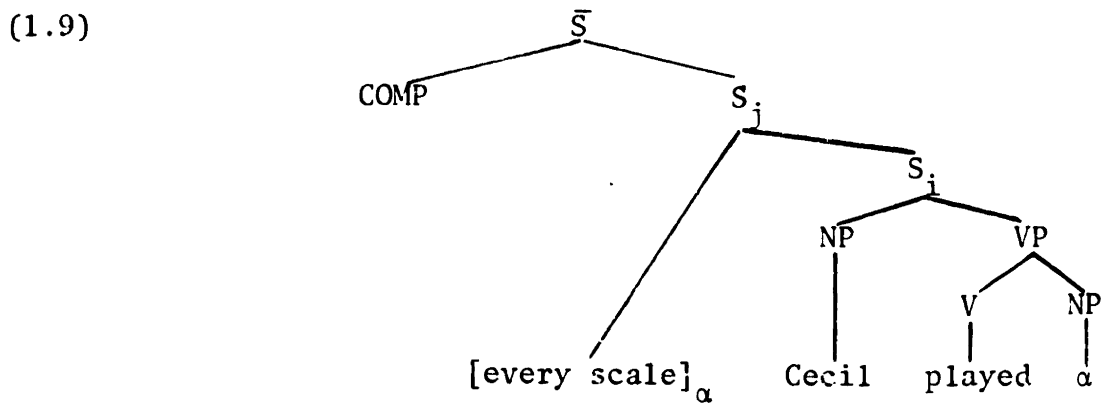
The effect of the Condition on Proper Binding is to mandate that in order for a logical form to be well-formed, every occurrence of a variable which it contains must be c-commanded by the phrase which binds it. This condition must be stated as a condition on well-formed logical forms, if

we wish it to generally characterize when a variable is properly bound. This is because Logical Form is the only level of linguistic representation at which all of the types of variables enumerated above are present. (Notice that we differ here from Fiengo (1974), who holds that proper binding is defined over representations at the level of Surface Structure.) The Condition on Quantifier Binding pertains only to those cases in which the binding phrase contains a quantifier. This condition must also be a condition on Logical Form, since, given the functioning of QR as a rule mapping from Surface Structure to Logical Form, the latter level is the only level at which all quantified noun phrases can bind variables. At this level, then, every quantifier must c-command all occurrences of the variable which it binds.

The significance of the Predication Condition, the Condition on Proper Binding and the Condition on Quantifier Binding is that they determine, in part, what sorts of structures at Logical Form are interpretable by the rules of quantifier interpretation for natural languages. They are by no means to be construed as necessary condition on the interpretability of logical systems, per se; rather, they are conditions only on the interpretability of logical representations of natural language sentences. The status of these conditions, then, is an empirical matter. They are of interest only insofar as they contribute to the correct determination of the range of possible interpretations of the differing types of natural language constructions.

In formulating QR, we did not specify what type of adjunction operation the rule effects. Indeed, we may assume that QR performs any

type of adjunction which results in a structure which satisfies the Condition on Quantifier Binding, i.e., where every quantifier in a sentence c-commands all occurrences of the variable which it binds. We will hold, though, for reasons which will be discussed momentarily, that QR Chomsky-adjoins phrases to S. Thus, consider (1.9), which is (1.5) in tree form:



In (1.9), the quantified noun phrase 'every scale' has been Chomsky-adjoined to S_j , binding the variable ' α '. In this structure the phrase 'every scale' c-commands the variable which it binds, since the first branching node dominating it is S_j , which also dominates ' α '. Therefore, (1.9) satisfies both the Condition on Proper Binding and the Condition on Quantifier Binding, as the variable ' α ' is properly bound by the quantified phrase 'every scale'.⁹

The central reason for holding that QR functions to Chomsky-adjoin a phrase to S is that under this assumption it is possible to give a clear and concise characterization of the notion of a quantifier's "scope" in terms of the hierarchical constituent structure of logical forms, as follows:

The scope of a quantified phrase ϕ is everything which it c-commands

For example, in the logical form (1.9), the quantified phrase 'every scale' c-commands S_i , and hence it c-commands every node which S_i dominates. The scope of this phrase, then, is S_i .

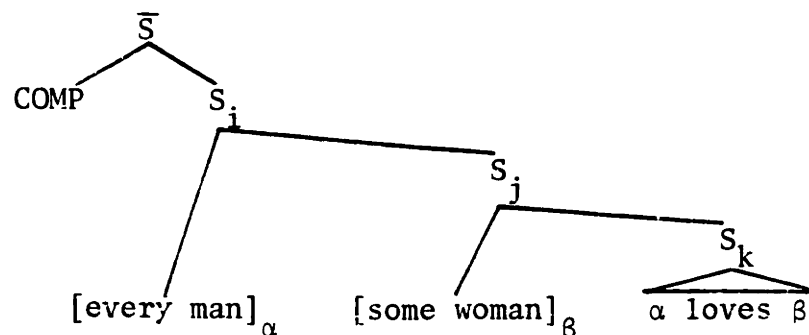
Given this definition, we may further define wide or narrow scope for logical forms containing more than a single quantifier:

A quantified phrase ϕ has wide scope with respect to a distinct quantified phrase ψ iff ψ is included in the scope of ϕ , and not vice versa.

A quantified phrase ϕ has narrow scope with respect to a distinct quantified phrase ψ iff ϕ is included in the scope of ψ and not vice versa.

Thus, consider the structure in (1.10), which contains two quantified phrases to which QR has applied:

(1.10)



In (1.10), the scope of 'every man' is S_j , and the scope of 'some woman' is S_k . Since the latter phrase is a constituent of S_j in this structure, it is included within the scope of the phrase 'every man'. Thus, given the above definitions, we may say that 'every man' has wider scope than 'some woman', and that 'some woman' has scope narrower than 'every man'.¹⁰

From the definitions developed above of proper binding and scope, it follows that for a variable to be properly bound, it must fall within the scope of the binding quantified phrase. Thus, it is essentially the linguistic notion of proper binding which corresponds to the notion of a bound variable employed in quantification theory.

At bottom, the notions of proper binding and scope are intimately related to the form and functioning of the "rules of interpretation" for sentences containing quantifiers. We shall assume in what follows that these rules essentially constitute the recursive clauses of a Tarskian truth-condition theory for natural language quantification. While we will not broach the question of the exact nature of this theory here, (see Cushing (1976) for some interesting suggestions along these lines), we are concerned with the issue of the appropriate level of representation over which the clauses of the theory are defined. Given our conception of grammar, it is apparent that this level could not be Logical Form, since at this level only structures corresponding to the unmarked interpretation of a sentence exist. We will assume, therefore, that there is a distinct level of representation, LF' , at which structures corresponding to both the marked and unmarked interpretations exist. Representations at LF' are derived by rules applying to the output of the rules of sentence

grammar; i.e., by rules applying to representations at the level of Logical Form, as illustrated in (1.11):

$$(1.11) \quad \underbrace{DS \rightarrow SS \rightarrow LF \rightarrow LF'}_{\text{core grammar}}$$

(LF' is what Chomsky (1975a), (1976) has called SR.) Since the rules mapping from Logical Form to LF' are not rules of core grammar, they are not constrained by the restrictions limiting the expressive power of rules of core grammar.¹¹ For example, the structural descriptions of these rules may mention labelled brackets, essential syntactic variables, specific lexical items, and, furthermore, their functioning may be governed, in some cases, by non-grammatical factors. We will also assume that they may effect a wider range of structural changes. This enrichment in expressive power for rules mapping from LF onto LF' allows for the formulation of rules which we shall call "conversion rules". The conversion rules which interest us are those which, so to speak, convert natural language quantifiers into logical quantifiers. We may think of them, for instance, as mapping representations like (1.5) and (1.7), at Logical Form, into representations at LF'. While there are many factors

$$(1.5) \quad [{}_S[\text{every scale}]_\alpha [{}_S\text{Cecil played } \alpha]]$$

$$(1.7) \quad [{}_S[\text{somebody}]_\alpha [{}_S^\alpha \text{saw Dexter}]]$$

weighing on the issue of the correct notation for representations at this level, for the sake of clarity we will assume a notation along the lines illustrated by the structures in (1.12) and (1.13), derived from (1.5) and (1.7), respectively:

$$(1.12) \quad [{}_S \forall \alpha [{}_S [{}_S \alpha \text{ is a scale}] \rightarrow [{}_S \text{Cecil played } \alpha]]]$$

$$(1.13) \quad [{}_S \exists \alpha [{}_S [{}_S \alpha \text{ is a person}] \& [{}_S \alpha \text{ saw Dexter}]]]$$

Structures such as (1.12) and (1.13), at the level of LF', we will refer to as "converted forms".

We may think of LF' as one of a number of "interpretive" levels of the grammar, along with, for example, levels of phonological interpretation, (PI) and morphological interpretation (MI). We assume that the general characteristics of these levels is determined by general linguistic theory, and that Universal Grammar determines the nature of the rules mapping onto these interpretive levels. In particular, we will hold that Universal Grammar specifies that these rules map from some level of core grammatical representation onto an interpretive level. For example, while LF' is constructed by rules mapping from Logical Form, the rules mapping onto PI map from Surface Structure. The basic picture of grammatical organization which arises, then, is (1.14):

$$\begin{array}{ccc}
 (1.14) & \{DS \rightarrow SS \rightarrow LF\} \\
 & \downarrow \quad \downarrow \\
 & PI \quad LF'
 \end{array}$$

The nature of the rules mapping from LF into LF' will be discussed in some detail in Chapter Four.

1.4 Simple sentential constructions. In much of what follows in this thesis, we will be concerned with sentences which display quantifier scope ambiguities. In common with most other analyses of quantifiers in natural language, we will hold that such ambiguities should be captured by being able to associate a sentence which is n-ways ambiguous with n distinct logical forms. We wish, therefore, that the translation function mapping from sentences into their logical forms be disambiguating, i.e., that representations at the level of Logical Form be unambiguous. A classic example of the sort of ambiguity we have in mind is displayed by (1.15):

$$(1.15) \quad [{}_S [{}_{NP}[_Q \text{every}] \text{man}] \text{ loves } [{}_{NP}[_Q \text{some}] \text{woman}]]$$

(1.15) is ambiguous between a reading under which it is being asserted that for each man, there is some woman or other that he loves, and a reading where it is being asserted that there is a woman, such that she is loved by every man. That sentences with this structure should be ambiguous in this way is explained by the fact that, given our assumptions,

there are two distinct (i.e., non-equivalent), well-formed logical forms which may be generated from its surface structure. Thus, note that in (1.15), there are two noun phrases which satisfy the structural description of QR: 'every man' and 'some woman'. QR mandates that each of these quantified noun phrases be adjoined to an S. There are two possible structures satisfying the Condition on Proper Binding and Quantifier Binding, which can be generated in this manner. These structures are illustrated in (1.16) and (1.17):

$$(1.16) \quad [S_i [\text{every man}]_\alpha [S_j [\text{some woman}]_\beta [S_k \alpha \text{ loves } \beta]]]$$

$$(1.17) \quad [S_i [\text{some woman}]_\beta [S_j [\text{every man}]_\alpha [S_k \alpha \text{ loves } \beta]]]$$

Both (1.16) and (1.17) are well-formed logical forms, since both quantified phrases, 'every man' and 'some woman' c-command, and hence, properly bind, the variables, ' α ' and ' β ', which they bind. In (1.16), the quantifier 'every' has wider scope than the quantifier 'some', since the noun phrase 'every man' c-commands the noun phrase 'some woman', while in (1.17), the reverse scope order obtains; here, 'some woman' has scope wider than 'every man'. These structures represent, at Logical Form, the two readings described for (1.15) above.

It is appropriate at this point to introduce a bit more nomenclature. Both of the logical forms in (1.16) and (1.17) are of the type that we will refer to as "non-linked", since all of the quantifiers in the sentence bind variables in the main predicate. This is in contrast to "linked"

logical forms, in which only one of the quantified phases in a multiply quantified logical form binds a variable in the main predicate. We will discuss this latter type of logical form in detail in Chapters Two and Three. We will also speak of logical forms being either "natural" or "inverse" vis-a-vis the surface structures from which they are derived. Thus, (1.16) is a naturally non-linked logical form, since the scope order of the quantifiers is the same as their order in (1.15); (1.17), on the other hand, is inversely non-linked, since the order of the quantifiers is the mirror image of their order in (1.15). We shall see below that linked logical forms may be natural or inverse as well.

Since the earliest investigations into constraints on transformational rules (e.g., in Chomsky (1962) and (1964)), and especially since Ross (1967), it has been held by most linguists that there exist formal constraints on the functioning of the transformational rules of sentence grammar. An application of a rule in the derivation of a sentence, which violated one of these constraints, would result in an ill-formed sentence. Given this mode of explanation, the actual derivation of a sentence is of central importance, in order to detect whether any constraint had been violated by an application of some rule. In the conception of sentence grammar being assumed here, though, the derivation of a structure does not serve this central explanatory role. Rather, explanation resides in whether a structure (at the level of Logical Form) satisfies a general set of well-formedness conditions. We are interested in a derivation only insofar as we wish to prove that a given structure, which satisfies the well-formedness conditions, is in fact, generable.¹³ For example,

with respect to the logical forms (1.16) and (1.17), all that is significant is that there are only two distinct structures generable from (1.15) which satisfy the well-formedness conditions of logical forms. The significance of examining the possible derivations of these structures is to show that, given our assumptions about the nature of QR, these are, in fact, the only structures generated which satisfy the well-formedness conditions. In showing this, it need not be the case that a structure has a unique derivation; there may exist, for any given structure, n equivalent derivations of structures satisfying the well-formedness conditions. This is, in fact, the case with regard to (1.16) and (1.17). In the derivation of (1.16), QR could have applied to either of the quantified noun phrases in (1.15), since they both satisfy the structural description of the rule. If it applies first to the noun phrase 'every man', (1.18) is derived:

$$(1.18) \quad [S_j [\text{every man}]_\alpha [S_i \alpha \text{ loves} [NP [Q^{\text{some}}] \text{ woman}]]]$$

QR would then reapply in this structure, to 'some woman', adjoining it to S_i . This would derive (1.16). Alternatively, QR could have applied first to the noun phrase 'some woman', deriving (1.19):

$$(1.19) \quad [S_j [\text{some woman}]_\beta [S_i [NP [Q^{\text{every}}] \text{ man}] \text{ loves } \beta]]$$

To derive (1.16), QR would then apply to 'every man', Chomsky-adjoining it to S_j . Similarly, the logical form (1.17), where 'some' takes wider scope, could also have been derived in two different ways. Either QR first

applies to 'every man', deriving (1.18), and then adjoins 'some woman' to S_j , or it applies to 'some woman' first, deriving (1.19), and then to 'every man', adjoining it to S_i . Either way, only a single logical form, (1.17), will be generated. This shows, then, that (1.16) and (1.17) are the only logical forms generable from (1.15) which satisfy the well-formedness conditions of logical forms, i.e., which satisfy the Condition on Proper Binding and the Condition on Quantifier Binding.

Given our assumptions to this point, then, it is possible to account for the range of possible logical forms which can be associated with sentences of a single clause, as a function of their structure. This function is factorial: For any given clause S which contains \underline{n} quantified noun phrases, there are $\underline{n}!$ possible formally distinct well-formed logical forms which may be associated with it.¹⁴ We have already seen that sentences like (1.4) and (1.6), which are unambiguous, can only be associated with a single logical form. We have also seen that subject-verb-direct object constructions containing two quantified noun phrases are ambiguous. This is a general property of single clause sentences containing two quantifiers; for example, (1.20) and (1.21) are also ambiguous.

- (1.20)a Everyone gave to some cause
 b Some politician ran on every ticket

- (1.21) John gave a present to everyone

Sentences containing three quantified noun phrases, such as (1.22), are

predictably six ways ambiguous.

(1.22) Everyone brought a present for many of my friends

I leave it as a task for the reader to discern the different readings.

1.5 The marked case. Recall the goal of this thesis: To distinguish those interpretations of sentences which represent the unmarked, or universal cases, from the marked cases, which represent idiosyncratic properties of a language. Up to this point, we have been concerned with the unmarked interpretation of simple transitive and intransitive constructions, i.e., those interpretations which are represented by logical forms which are directly generable by the rules of sentence grammar. Thus, we have seen that a sentence like (1.23), which contains a quantified object noun phrase, can only be associated with a single well-formed logical form, (1.24):

(1.23) Earl played a beautiful song

(1.24) $[_S[a \text{ beautiful song}]_\alpha [_SEarl \text{ played } \alpha]]$

There do exist sentences, for example those in (1.25), which are of the

(1.25)a John wants a lilliputian for his birthday
 b Harry is seeking a unicorn

same structure as (1.23), containing a single quantifier, but which are ambiguous. As has been noted, for example by Quine (1960), as well as many others, sentences like (1.25) may either have a transparent (or referential), reading, parallel to the interpretation of a sentence like (1.23), or an opaque (non-referential) reading. Under the latter interpretation, asserting the sentences in (1.25) does not commit the speaker either to the existence of lilliputians or unicorns, respectively. On the transparent interpretations, though, the existence of lilliputians and unicorns is being asserted.

The existence of the ambiguity displayed by sentences like (1.25) is by no means a general property of simple transitive sentences. Rather, the existence of the opaque interpretation in this type of structure is quite idiosyncratic. For instance, its occurrence is dependent, in part, upon the nature of the verb. It is only a small subset of transitive verbs which allow the opaque interpretation, among them 'want', 'seek', 'look for', 'desire', etc. This class of predicates is not co-extensive with the class of predicates which induce opacity when they occur in matrix-complement constructions. For example, sentence (1.26),

(1.26) John believed a unicorn

containing 'believe' is unambiguous, only having the somewhat odd transparent interpretation. Furthermore, in sentences containing predicates like 'look for' or 'want', the marked opaque reading is only possible

if the quantified noun phrase is the object of the verb; if it is the subject, then only the transparent reading is possible. Thus, (1.26) only has the odd transparent reading, asserting the existence of unicorns. (Opacity, though, is not limited to object position in simple sentential construction; certain predicates also seemingly allow an opaque reading when a quantified noun phrase occurs in subject position, as for example in (1.27):

(1.27) A unicorn is desirable to Lois

In contrast, a transparent interpretation is possible in simple transitive and intransitive constructions regardless of whether a quantified noun phrase appears in subject or object position.

In general then, we may say that in simple sentential constructions, both transitive and intransitive, a transparent, or (or referential) interpretation is always available. This is regardless of the particular predicates and noun phrases which a sentence contains. Some transitive sentences though also allow an opaque interpretation, whose existence is governed, at least partially, by semantic properties of the predicate of the sentence. Thus, in simple transitives, the transparent interpretation is the unmarked case, while the opaque interpretation is marked in sentences of this type.¹⁵

It is just this distribution of interpretations which is predicted by the theory being presented here. Thus, given the formulation of QR, and the Conditions on Proper Binding and Quantifier Binding, the only

logical form generable for simple transitives with object quantified phrases is as in (1.24). Therefore, the only logical forms directly generable from the surface structures of the sentences in (1.25) are those in (1.28), which represent their transparent interpretation.

- (1.28)a $[_S[a \text{ lilliputian}]_\alpha [_S\text{John wants } \alpha \text{ for his birthday}]]$
 b $[_S[a \text{ unicorn}]_\alpha [_S\text{John is seeking } \alpha]]$

Given the expressive power of sentence grammar, then, it is only possible to determine what sentences like (1.25) have in common with other sentences of the same construction, i.e., that they have a transparent interpretation. It is this aspect of the interpretation of these sentences which is determinable solely from their structure. In accounting for the existence of the marked opaque interpretation in this structure, on the other hand, it is also necessary to take into account idiosyncratic properties of the verbs and nouns actually occurring in a particular sentence. Since this information is not available to govern the functioning of rules of sentence grammar, we must account for the opaque reading of sentences (1.25)a and (1.25)b in a manner which is distinct from sentence grammar. In Chapter Four we will return to some suggestions for the analysis of these marked cases.

1.6 On the insufficiency of surface structure. The success of the analysis of scope presented here, where this notion is defined in terms of c-command relations in Logical Form, is in contrast to the difficulties

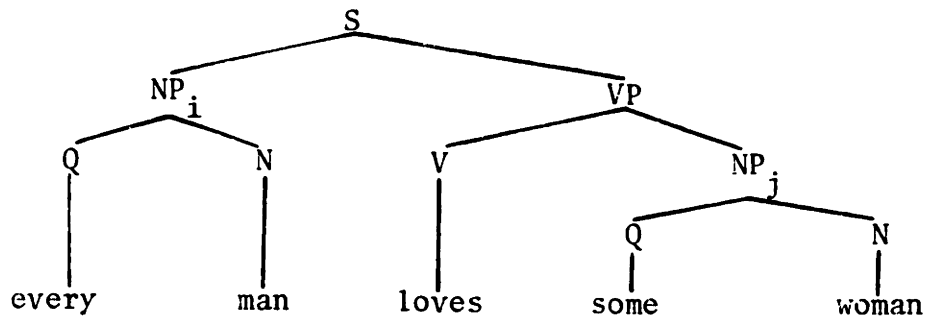
facing a theory which attempts to define scope relations from c-command relations in surface structure.¹⁶ A theory of the latter type is presented in Reinhart (1976), which postulates the following principle for determining the scope of quantifiers from their surface structure positions:

A logical structure in which a quantifier binding a variable \underline{x} has wide scope over a quantifier binding a (distinct) variable \underline{y} is a possible interpretation for a given structure S just in case in the surface structure of S the quantified expression corresponding to \underline{y} is in the (c-command) domain of the quantified expression corresponding to \underline{x} .

(Reinhart (1976), p. 191)

(The c-command domain of a node \underline{A} is \underline{A} itself, and all of those nodes which it c-commands.) In effect, what this condition states is that if a quantifier Q_i c-commands another quantifier Q_j in surface structure, then there is a possible logical form in which Q_i has wider scope than Q_j . There are two significant problems which arise from this theory, both of which Reinhart points out. First, it predicts that transitive sentences in which both the subject and object noun phrases contain quantifiers are unambiguous, with the subject quantifier taking wider scope. For example, consider (1.29), which is the surface structure of sentence (1.15):

(1.29)

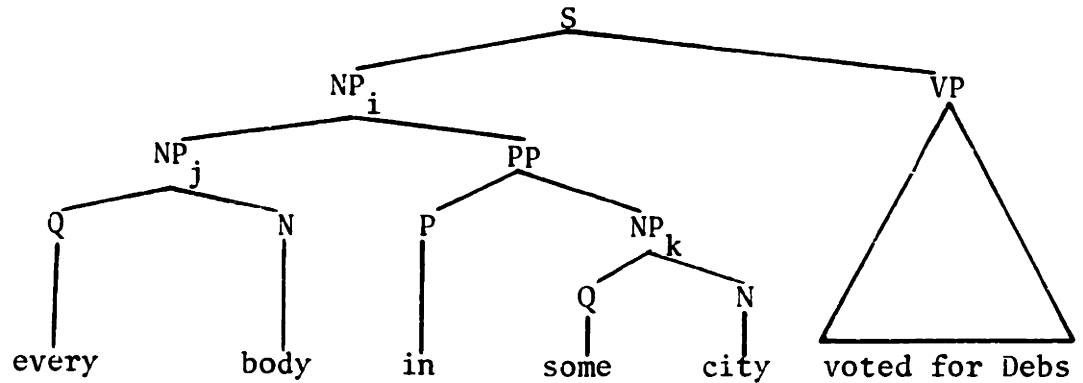


In (1.29), since NP_i c-commands NP_j , but not vice versa, Reinhart's condition predicts that it is only possible to associate (1.29) with a logical form in which the subject quantifier takes wider scope. But, as we saw in the discussion above, sentences with a structure as in (1.29) are, in fact, ambiguous. Either of the quantifiers may be interpreted as having wider scope. Thus, Reinhart's condition incorrectly predicts the range of possible interpretations for sentences like (1.29).¹⁷ On the other hand, the fact that sentences like (1.29) may be ambiguous follows from defining scope, in terms of c-command, over representations at the level of Logical Form, rather than over surface structures. This result, in turn, follows from assuming that logical forms are generated by QR, construed as a rule of sentence grammar, mapping from Surface Structure to Logical Form.

The second problem which Reinhart acknowledges concerns the interpretation of PP-complement structures like (1.30), whose surface structure is (1.31).

(1.30) Everybody in some city voted for Debs

(1.31)



The problem here is that NP_j c-commands NP_k , and not vice versa. Thus, Reinhart's condition predicts that the only logical form which it is possible to associate with (1.30) is one in which the quantifier 'every' has wider scope than 'some'. But, in fact, (1.30) does not have an interpretation where 'every' has wider scope. Rather, it only has a reading where the embedded quantifier, 'some', has wider scope; (1.30) could be roughly paraphrased as 'There is a city, such that everybody in it voted for Debs'. In other words, Reinhart's condition incorrectly predicts the possible interpretation of sentence (1.30).¹⁸ This problem does not arise, though, under the theory being proposed here. In Chapter Two, we will see that the explanation of the range of interpretation of sentences like (1.30) follows from the same principles as the explanation of the range of interpretation of sentences like (1.29), i.e., from QR, and the Conditions on Proper Binding and Quantifier Binding.

FOOTNOTES

Chapter One

- 1 This formalism precludes the formulation, as a rule of sentence grammar per se, of rules such as Q-float. Under the approach to linguistic markedness being assumed here, in which the rules of sentence grammar account for the unmarked, or general, cases, this is not an uninteresting result, since this rule exhibits a great deal of idiosyncratic behavior. For an indication of the complexity involved, see Lasnik and Fiengo (1974), Postal (1976) and Fiengo and Lasnik (1976).
- 2 Notice, that rather than including an immediate domination clause in the Condition on Analyzability, we could alternatively impose the following filter condition (in the sense of Chomsky and Lasnik (1977)) on the output of the rules of sentence grammar at Logical Form:

$$(i) \quad * \dots [{}_A [{}_A t] \dots] \dots, \text{ where } A \text{ is } [+N]$$

This condition has the effect of marking as ill-formed any structure which contains a $[+N]$ -phrase which immediately dominates another $[+N]$ -phrase, which in turn immediately dominates a trace. If we formulate the immediate domination condition in this manner, as a local filter, then it is not a condition on how structures may be analyzed so as to satisfy the structural descriptions of transformational rules; rather, in common with the conditions to be discussed

below, it is a well-formedness conditions on representations at the level of Logical Form.

Given (i), we may reformulate the Condition on Analyzability as in (ii):

(ii) Condition on Analyzability

If a rule ϕ mentions SPEC, then ϕ applies to any [+N]-phrase dominating SPEC

- 3 While we will informally represent traces bound by quantified noun phrases by Greek letters, we will assume that in common with other trace elements, they are to be represented as indexed empty nodes, i.e., as $[_{NP_i} e]$, (or as $[_{AP_i} e]$), where 'i' is an index, as suggested in Chomsky and Lasnik (1977). A trace is bound, then, if it is co-indexed with another noun phrase (or adjective phrase). We will represent the binding phrase as $[_{NP \dots}]_i$ (or $[_{AP \dots}]_i$). We may think of these indices as part of the labelling on the bracket of [+N]-phrases. If there is more than one empty phrase with a given index, they are all to be construed as occurrences of the same variable; e.g., traces which arise from successive movements of a single phrase will count as occurrences of the same variable. In what follows, we will generally speak of those indices which arise as the result of the functioning of rules mapping from Deep to Surface Structure as traces, and those arising from QR as variables, although these terms are interchangeable.

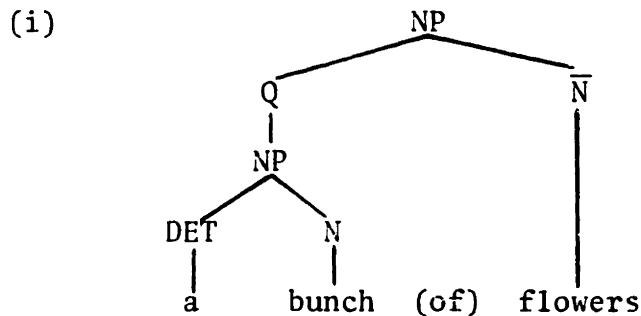
- 4 While we have mentioned the term 'SPEC(\bar{N})' as a term of the phrase structure rules expanding the category NP, we do not mean to say that 'SPEC(\bar{N})' is itself a categorial symbol. The notion of "specifier" is a functional notion of the grammar, comparable to the notions "subject" or "object". Thus, the value of SPEC(\bar{N}) may either be the category Q or the category DET, (or it may be null). It would, therefore, be more proper to state the phrase structure rule we have in mind as (i):

$$(i) \quad NP \rightarrow \left\{ \begin{matrix} Q \\ DET \end{matrix} \right\} - \bar{N}$$

\bar{N} is not the only category for which the notion specifier is defined. For example, we can think of the auxiliary system as the specifiers of verbs, and the complementizers as the specifiers of sentences. For more discussion of the significance of this notion, see Chomsky (1970) and Jackendoff (1974), (1977).

- 5 This category may display quite a bit of internal complexity. For example, Jackendoff (1977) has pointed out examples in which quantifiers themselves have determiners, as in 'a few', 'those many', 'the most', 'John's several', etc. The class of quantifiers which allow determiners, however, is quite limited, viz., *'a every', *'those all', *'the some', etc. Quantifiers may also be compounded, as in 'a few too many', 'many too many', etc. In these cases, it is normally the case that the entire compound is construed as a single

quantifier. Another sort of complexity has been noted in Bresnan (1973), Akmajian and Lehrer (1976) and Selkirk (1977). They point out the existence of phrases which overtly have noun phrase structure, but which semantically behave as quantifiers. These are measure phrases, such as 'a bunch' or 'a number'. We can account for this fact, under our assumptions regarding the functioning of QR, if we assume that measure phrases have the structure in (i):



(Notice the formal similarity of this structure to the structure of possessive noun phrases, the only significant difference being that the possessive structure has a DET node rather than a Q node.) (i) represents the fact that measure phrases are quantifiers. Hence, QR applies to this noun phrase in the same manner as it does to a simple noun phrase such as 'some flowers', i.e., it would affect the entire noun phrase 'a bunch of flowers', where the phrase 'a bunch' is taken as satisfying the term Q of QR.

These brief remarks show that the category Q allows internal recursion. For a more detailed discussion of the range of the recursion, see Jackendoff (1977) and Bresnan (1973), who postulates

the existence of a QP node.

- 6 Representations like (1.5) and (1.7) are given in a shorthand notation; more correctly, they should be stated as in (i) and (ii):

(i) $[_S[_{NP}[_Q \text{every}] \text{scale}]_\alpha [_{S_i} \text{Cecil played } [_{NP_\alpha} e]]]$

(ii) $[_S[_{NP}[_Q \text{some}] \text{body}]_\alpha [_{S_i}[_{NP_\alpha} e] \text{saw Dexter}]]]$

In what follows, we will adopt a number of other shorthand conventions for the sake of convenience. Thus, while the constituency of surface structures is carried over in logical forms generated by QR, as (i) and (ii) show, we will not, in general, explicitly note this fact; for expository purposes we will eliminate, in many cases, the brackets around the quantifier, as well as the phrasal label of quantified phrases in logical forms, where it is inconsequential to the argument at hand.

- 7 We are also taking the object of a preposition as an argument position. As Emonds (1976) points out, prepositions subcategorize for a nominal object; there exist both transitive and intransitive prepositions. Since we are assuming that all subcategorized noun phrase positions are argument positions, it follows that the object of a preposition is also an argument position.

Notice, that with respect to the Predication Condition, pronouns which are not construable as bound variables, as for example 'he' in 'He left', are not to be taken as "free" variables. Rather they function, in this case, essentially as referring expressions, having deictic reference. Pronouns serving other semantic roles, (such as pronouns of laziness), will also be taken as satisfying the Predication Condition.

- 8 The condition on Quantifier Binding should be taken as asserting that, in natural languages, there is nothing comparable to the sort of "vacuous" quantification exhibited by logical formulae such as ' $\forall x (2+2=4)$ '. Such formulae are generally taken to be true, by convention, even though they contain a quantifier which does not bind a variable. Consider, in contrast, the natural language paraphrase of this formula:

(i) Everything is such that two plus two equals four

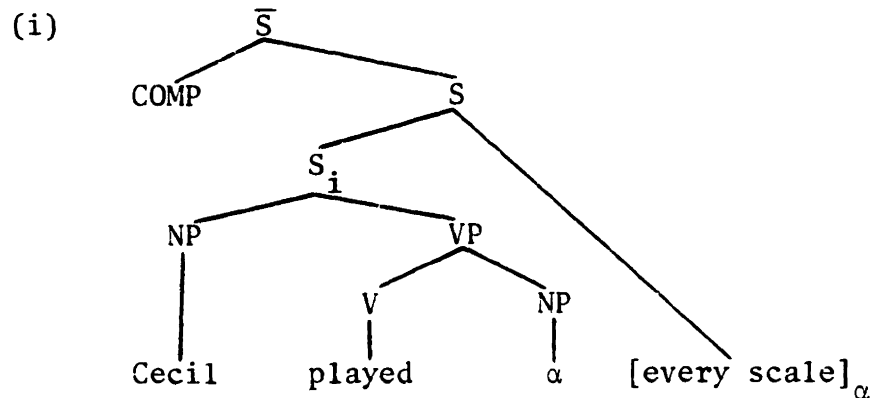
Given that this is a sentence of English, QR applies to the quantified phrase 'everything', generating (ii) as the logical form of (i):

(ii) $[_S[\text{everything}]_\alpha [_S\alpha \text{ is such that two plus two equals four}]]$

(ii) does satisfy the Condition on Quantifier Binding, since the quantifier 'every' properly binds the variable ' α '. Thus, the

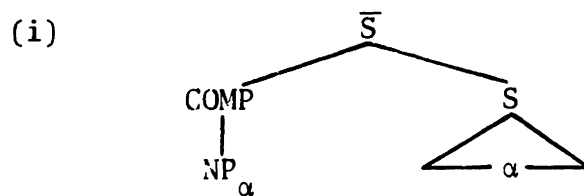
quantification in (i) is, in actuality, non-vacuous. The Condition on Proper Binding, therefore, distinguishes a significant difference in quantification in natural languages from quantification in conventional formal languages, such as first-order predicate logic.

- 9 Notice that since we have employed the notion c-command, which is defined over hierarchical structure, the linear sequence of the noun phrase and the sentence from which it was extracted in logical form is irrelevant. Thus, we could just have well represented the logical form associated with sentence (1.5) as (i):

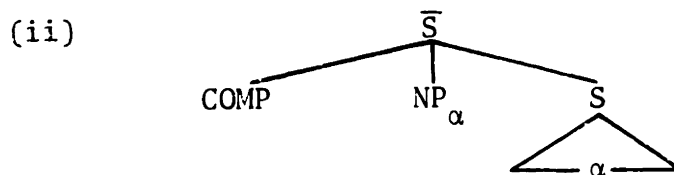


This is because the c-command relations in (i) are identical to those in (1.9); 'every scale' still c-commands 'α', so (i) satisfies the Condition on Proper Binding and the Condition on Quantifier Binding. In what follows we will represent quantified phrases in logical forms as standing to the left of the sentences from which they have been extracted, in order to maintain the graphic similarity of logical forms (in our sense) and standard logical representation.

- 10 It is worth noting here that there are a number of other structures which could conceivably be the structure derived by QR besides what we have assumed here, in which quantified noun phrases are Chomsky-adjoined to S. One possibility is that the quantified noun phrase is moved into the COMP position, as are wh-phrases, deriving the structure pictured in (i):



Holding this position amounts to assuming that COMP is not a categorial node, but rather is the pre-sentential adjunction site. This position has been argued for recently by Bowers (1976). A second possibility is that the quantified noun phrase is daughter-adjoined to \bar{S} , as a sister to S. This is illustrated in (ii):

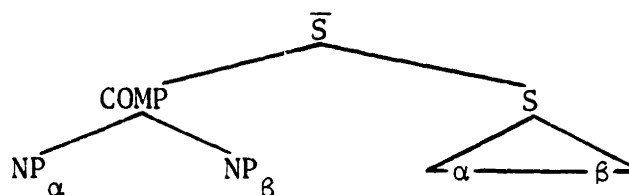


This structure is consistent with taking COMP to be the specifier of S, ranging over the complementizer elements 'that', 'for', 'whether', 'which', etc., rather than being a general adjunction site. This position, that COMP is the specifier of S, has recently been

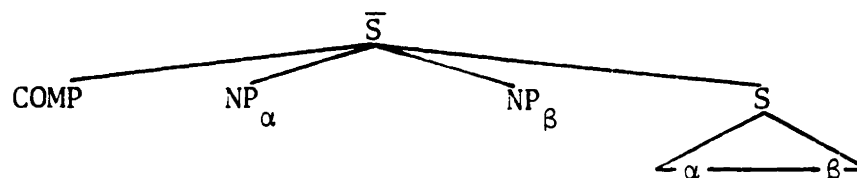
elaborated, along somewhat different lines, in Chomsky and Lasnik (1977).

The significant difference in opting for one of these two structures over what we are assuming above, becomes apparent when we examine the properties of structures containing more than a single quantifier. (iii) is the type of structure derived on the assumption that QR moves a phrase into COMP, while (iv) is the structure generated by assuming that the quantified noun phrase is daughter-adjoined to \bar{S} .

(iii)



(iv)



In these two structures, in order to define notions of scope, it would be necessary to invoke some other notion than c-command, since in both (iii) and (iv) NP_α and NP_β c-command each other. A plausible additional notion to invoke here is a linear notion, such as "precedence". The scope of a quantified phrase would then essentially be defined as all those elements which it precedes, with the notions of wide and narrow scope being defined with respect to this definition.

While there are a number of empirical reasons arguing against these two structures, (cf. Section 2.4, esp. fn. 7), the primary methodological grounds for preferring a theory in which QR functions to Chomsky-adjoin a noun phrase to S is that it allows us to stay within a framework of anaphora in which we need only invoke the hierarchical notion c-command. Thus, assuming Chomsky-adjunction permits the statement, in terms of c-command, not only of the definition of proper binding, but of scope as well. If we assume, on the other hand, that QR either moves a quantified noun phrase into COMP, or daughter-adjoins it to S, then, an extra linear notion need be employed, that of "precedence". This is in addition to the c-command condition on hierarchical structure, which is still needed for the definition of proper binding. Thus, if we assume either structure (iii) or (iv), it is seemingly not possible to provide a uniform and general account of the closely related notions of scope and proper binding. The chief methodological advantage, then, of holding that QR is a Chomsky-adjunction is that this assumption is consistent with a theory which is of greater generality than a theory which is consistent with either of the other structures described in this footnote.

- 11 Notice that since rules mapping from LF to LF' are not rules of sentence grammar, their functioning may also be determined by properties of discourses. For a discussion of discourse rules, which may be construed as rules mapping to the ultimate converted form of

a sentence, see Williams (1977).

- 12 This was pointed out to me by Robert Freidin, who has recently argued (Freidin (1977)) that derivational notions like the strict cycle should not be taken as theoretical primitives. Rather, he argues, the explanatory role attributed to the strict cycle follows as a consequence of deeper universal grammatical principles, in particular the Predication Condition, The Subjacency Condition and the Tensed-S and Specified Subject Conditions, conceived as well-formedness conditions on the output of sentence grammar.
- 13 Given this conception of derivation, as an existence proof of a structure, the rules of sentence grammar could be conceived of as analogous to rules of inference, and the cycle as a valid proof procedure, i.e., a method for proving, by the rules of sentence grammar, that a particular structure is, in fact, generable. This view of the cycle is consistent with the remarks in fn.12, since the cycle is not being construed as having explanatory significance, only as having descriptive significance, in that it provides a procedure for describing the derivation of a structure.
- 14 It should be noted here that we wish to be able to account for the set of distinct possible well-formed logical forms which are generable from a given type of surface structure. There may be factors, though, independent of structural considerations, which conspire,

in particular instances of a type of structure, to make one of the possible interpretations the "natural" or "preferred" one. These factors include morpho-lexical, intonational and pragmatic properties of sentences, which lay beyond the scope of grammatical theory, *per se*. For example, lexical properties of the different quantifiers may be a factor. It is often held that the quantifier 'each' has a propensity to take wider scope, while 'all' is more comfortably construed as taking narrow scope. (It should not be thought that these are, in any sense, absolute prescriptions. As example (i) shows, 'each' may be construed as taking narrow scope, and, as (ii) shows, 'all' may be construed as taking wide scope:

(i) Each of my brothers loves a woman from France

(ii) A Democrat won all of the important positions

(These examples are from Kroch (1975)). Also, quantifiers which appear in subject position are often more naturally construed as taking wider scope than other quantifiers in the sentence. This property is presumably a function of the subject normally being the "topic" position in the sentence. Furthermore, other intonationally-based notions like "focus" may be involved in determining the preferred interpretation, as well as factors like contrastive stress. Finally, it may be the case that one of the logical forms which may be associated with a sentence simply describes a pragmatically odd state of affairs, as for example in sentence (iii), (pointed out by K. Van Lehn):

(iii) A solution was found to all of Hilbert's problems

Here, it is simply odd to hold that a single solution was found for all the problems; rather, (iii) seems more naturally understood as asserting that each of Hilbert's problems received its own solution.

These observations barely touch the sorts of phenomena involved in determining preferential interpretation. For a more in-depth and detailed discussion, the reader is referred to Ioup (1975).

It should be kept well in mind that the distinction between preferred and non-preferred readings does not correspond in any way to the distinction between unmarked and marked cases. Thus, it may be the case, in a given sentence, that the marked reading is more highly preferred than the unmarked reading, or it may be that the unmarked case is more highly preferred. The distinction of unmarked and marked cases is not an issue of which reading of a sentence is, in some sense, more accessible to the speaker or hearer, rather it demarcates those phenomena which are reflections of our universal linguistic knowledge from those which reflect the knowledge we have of the particular language of which we are native speakers. There is no reason to think, though, that the former type of linguistic knowledge is any more accessible than the latter type. Presumably, our intuitions are equally strong in either case. Thus, while the marked/unmarked distinction is a linguistic distinction, the question of the preferred, (or more accessible) reading is a pragmatic, (or, if you will, a psychological) issue, which should not be confused with

this distinction.

- 15 The distinction between the opaque and transparent interpretations of sentences like (1.25) should not be confused with the specific/non-specific distinction in simple transitive structures. There are a number of differences between these phenomena. First, while the opaque/transparent distinction arises with any quantifier, the specific/non-specific distinction occurs only with indefinite noun phrases, i.e., those whose specifier element is either 'a' or 'some'. A second difference is that the opaque interpretation arises only when a noun phrase is the object of a transitive verb like 'want' or 'seek'. The possibility of a specific/non-specific ambiguity is much more general. It occurs in either subject or object position of any transitive verb, including those which do not allow an opaque interpretation in object position. Thus, in the sentences in (i), the noun phrase 'a car' can be interpreted as specific or non-specific in either case:

- (i)a John brought a car
 b A car broke the window

It may be the case that the specific/non-specific ambiguity in this case is a result of the vagueness of the quantifier 'a'. This is borne out by noting that the specific/non-specific distinction is dependent on pragmatic factors. For example, in the case of sentence (i)a, suppose that I am talking to Virginia, who receives

a phone call from John. After speaking on the phone, she says to me 'John bought a car', to convey the message she received on the phone. Now, whether (i)a is taken as specific or non-specific depends upon what Virginia intended to convey about what she heard on the telephone. If John had told her that he had bought the '57 Edsel that they had seen the other day in the used car lot, then Virginia uttered (i)a specifically. But, if John had simply said he bought a car, out of the blue, and would tell her the details later, then Virginia would have been uttering (i)a with non-specific intent, since she had no particular car in mind when uttering that sentence.

Notice, though, that in either of these contexts, the logical form associated with (i)a, which is (ii), would be true, since (ii)

$$(ii) \quad [{}_S[a \text{ car}]_\alpha [{}_S\text{John bought } \alpha]]$$

only asserts that there is a car which John bought. This indicates that the specific/non-specific distinction in simple transitive structures is not simply a matter of the logical forms associated with these structures, but rather arises from a vagueness in the interpretation of quantifiers such as 'a' and 'some', which are ultimately realized as existential quantifiers.

For a detailed discussion of the specific/non-specific distinction in English, see Kasher and Gabbay (1976).

is determined from surface structure c-command relations, but also theories such as that in Hintikka (1974), (1975), (1976), which determine scope from surface structure precede-and-command relations, as well as for those, as in Fitch (1973), which determine these relations solely from precedence. The reason for this is that, in examples like (1.29) in the text, since the subject quantifier precedes (as well as commands) the object quantifier, these theories make the identical predictions as Reinhart's, which is stated in terms of the more generally adequate notion of c-command (cf. fn. 10).

- 17 Reinhart (1976, pp. 193-4), presents two arguments attempting to minimize the significance of this problem. First, she argues that "most putative examples of such ambiguities which are discussed in the literature are ones where one interpretation entails the other" (p. 193). In these cases, the seeming ambiguity are actually cases of vagueness of interpretation. Second, she argues that in those examples which do display the ambiguity, and therefore violate her principle, "the violation is highly restricted with respect to the NP pairs which tolerate it." (p. 194). She then cites an observation of Ioup (1975), that judgements of ambiguity are more difficult to elicit if a quantified noun phrase in a verb phrase is the object of a preposition, rather than the object of the verb.

There are significant problems with both of these arguments, however. The problem with the first argument is that it predicts that an ambiguous sentence like (i) should be unambiguous, only having a

(i) Everyone convinced someone

reading in which the quantifier 'every' is construed as having wider scope. This is because 'everyone' c-commands 'someone' in surface structure, and the logical form associated with (i), which is (ii), does not entail (iii), which is the logical form which represents the

(ii) $[_S[\text{everyone}]_\alpha [_S[\text{someone}]_\beta [_S\alpha \text{ convinced } \beta]]]$

(iii) $[_S[\text{someone}]_\beta [_S[\text{everyone}]_\alpha [_S\alpha \text{ convinced } \beta]]]$

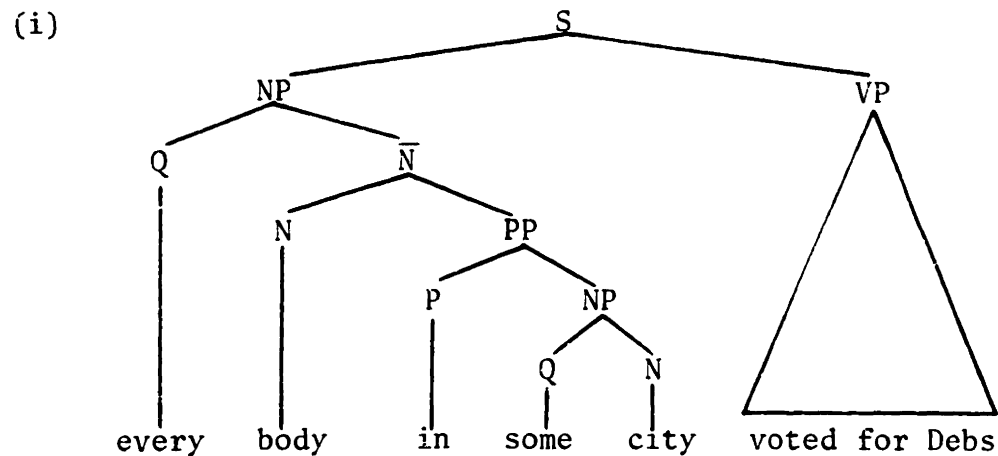
other interpretation of (i). But since Reinhart's principle only allows for (ii) to be directly associated with (i), sentences like (i) cast grave doubt on the validity of Reinhart's first argument.

As for her second argument, there simply seems to be numerous counter-examples, for example the sentences (1.20), repeated here:

- (1.20)a Everyone gave to some cause
 b Some politician ran on every ticket

Both of these sentences are clearly ambiguous, each having an interpretation where the quantified phrase which is the object of the preposition has wider scope than the subject quantifier.

the PP 'in some city' in (1.30) as a quantified expression it is at least possible to account for the scope properties of the quantifiers in this sentence. This is because the prepositional phrase c-commands the noun phrase 'everybody' in (1.31). Notice, though, that this account is dependent upon independent evidence that (1.31) is the correct structure of (1.30); if the structure is as in (i), then the prepositional phrase does not c-command the 'everybody', since the



first branching node dominating PP is \bar{N} , which does not dominate 'every'. (For further discussion of the relation of noun phrase structures to the interpretation of sentences containing them, see Chapter Two.)

Reinhart points out, though, that this account seems untenable on other grounds, since the same inverse scope relations hold in more complex structures like (ii):

- (ii) Some exits from every freeway to a large California city are badly constructed

Here, there is no structure in which the most deeply embedded PP, 'to a large California city' c-commands 'some exits'. Therefore, given Reinhart's condition, a reading of (ii) where 'a' is construed as having wider scope than 'some' should not be possible. But, indeed, the natural interpretation of (ii) is where the most deeply embedded quantifier has widest scope.

Examples like (1.30) and (ii) also pose problems for theories in which the relative scope of quantifiers is determined from surface structure precede-and-command relations, since the quantifier in these sentences which is construed as having wider scope in Logical Form is in surface structure preceded and commanded by the quantifiers which have narrower scope in Logical Form. Thus, a theory incorporating these notions also makes the incorrect predication concerning the range of possible interpretations of sentences containing PP-complements like (1.30) and (ii).

It has been held, for example by Hintikka (1975), that a precede-and-command condition is not to be taken as an absolute conditions, but rather as a principle of preferential scope order. Under this interpretation, the condition would assert that a reading of (1.30), in which 'every' is construed as having wider scope than 'some', is preferred, but not that other scope orderings are impossible. Presumably, this formulation allows for an inverse interpretation of sentences like (1.30), and (ii)). The problem, though, is that a reading of (1.30) where 'some' has wider scope is not the preferred reading of this sentence. In fact, this sentence seemingly does not have a reading in which 'some' is

understood as having wider scope. Thus, conceiving of precede-and-command conditions as preference conditions is of little help in this case, since the predicted preferred reading of (1.30) does not exist.

Chapter Two: QUANTIFIERS AND NOUN PHRASES

In the previous chapter, we began our examination into the types of logical forms associated with different constructions in English by examining single clause sentences containing simple noun phrases. What we saw there was that sentences of this construction are associated with non-linked logical forms. In this chapter, we will be discussing those constructions which are associated with "linked" logical forms, i.e., those logical forms, containing two or more quantifiers, where only one of the quantifiers binds a variable in the main predicate. The structures which are associated with logical forms of this type are sentences containing PP-complement and relative clause constructions. In the first part of this chapter, we will discuss the former constructions, and see that they are associated with inversely linked logical forms, in which only the quantifier having narrowest scope binds a variable in the main predicate. The second part will be devoted to a partial discussion of sentences containing restrictive relative clauses. Their logical forms, as we shall see, are naturally linked, with only the widest scope quantifier binding a variable in the main predicate.

2.1 PP-complement Constructions. It has been noted in the literature, (e.g., in Reinhart (1976), Hintikka (1974) and Gabbay and Moravscik (1974)), that sentences like those in (2.1), which contain PP-complement constructions in subject position, each have a reading in which the quantified phrase embedded as the object of the preposition is construed as having scope

- (2.1)a Everybody in some Italian city met John
- b Some people from every walk of life like jazz
- c All the gifts to some woman who was admitted yesterday are on the counter
- d Each of the members of a key congressional committee voted for the amendment
- e Every entrance to a large downtown store was smashed in the riot
- f Some houses near all of the nuclear plants in New Mexico will be contaminated within five minutes of meltdown

wider than the head quantifier; i.e., the scope order of the quantifiers in these sentences is understood as being the inverse of their surface order. For example, sentence (2.1)a is logically paraphrasable as 'There is an Italian city, such that all of the people in that city met John'. This inverse property of sentences containing PP-complements holds generally in sentences of this construction, regardless of which prepositions or quantifier words appear in the sentence, as is apparent from the examples in (2.1). Furthermore, as the examples in (2.2) illustrate, this generalization, that sentences containing PP-complement constructions have an inverse reading, also holds regardless of the depth of prepositional phrase embedding:

- (2.2)a Some exits from every freeway to a large California city are badly constructed
- b Some exits from every freeway to some cities in every county south of L.A. are badly constructed

(These examples are adapted from similar examples pointed out by Gabbay and Moravcsik (1974)). In these examples, the most deeply embedded

quantifier is understood as having widest scope, with the next most deeply embedded quantifier having next widest scope, etc. The head quantifier in these cases is understood, as it is in the examples in (2.1), as having narrowest scope. Thus, (2.2)a for example, can be logically paraphrased as 'There is a large California city, such that for all of the freeways to it, there are exits from those freeways which are badly constructed.'

What we wish to show in this section is that the logical forms characteristically associated with sentences like those in (2.1) and (2.2) which contain PP-complements are not only inverse, but that they are inversely linked. Thus, as we shall see shortly, the logical form associated with a sentence like (2.1)a, for instance, is (2.3), where only the most deeply embedded quantified phrase binds a variable in the main

$$(2.3) \quad [_S[\text{some Italian city}]_{\alpha} [_S[\text{everybody in } \alpha]_{\beta} [_S\beta \text{ met John}]]]$$

predicate. This is in contrast to the non-linked logical forms which were discussed in Chapter One. In these latter structures, all of the quantified phrases bind variables in the main predicate, as can be seen by comparing (2.3) with (2.4):

$$(2.4) \quad [_S[\text{some politician}]_{\alpha} [_S[\text{everybody}]_{\beta} [_S\alpha \text{ met } \beta]]]$$

In order to gain a better grasp of the significance of the notion of linking, as applied to logical forms, consider (2.5) and (2.6), which we may reasonably assume to be essentially the representations associated with

(2.2) and (2.3) at LF', respectively:

$$(2.5) \quad [_S \exists! \alpha [_S [_S \alpha \text{ is an Italian city}] \ \& \ [_S \forall \beta [_S [_S \beta \text{ is a person} \\ \text{in } \alpha] \rightarrow [_S \beta \text{ met John}]]]]]]$$

$$(2.6) \quad [_S \exists! \alpha [_S [_S \alpha \text{ is a politician}] \ \& \ [_S \forall \beta [_S [_S \beta \text{ is a person}] \rightarrow \\ [_S \alpha \text{ met } \beta]]]]]]$$

(where $\exists!$ is understood as meaning 'There is a particular...'). The difference between (2.5) and (2.6) is that in the former case the antecedent of the conditional which is within the scope of the universal quantifier is a dyadic predicate, while in the latter case it is a monadic predicate. This difference is reflected in the interpretation of (2.5) and (2.6). In (2.6), the universal quantifier ranges over the set of people. In (2.5), though, the universal quantifier ranges over a subset of the domain of the universal quantifier in (2.6); thus, the individuals who may serve as values of the variables bound by the universal quantifier in this latter case are those in a particular city in Italy.

The semantic effect of linking in logical forms, then, is that the domain of entities which may serve as the values of the variables bound by the non-initial quantifiers is more restricted than in comparable non-linked logical forms.

This property of sentences containing NP-PP sequences, i.e., that they are associated with inversely linked logical forms, is not entirely universal. Compare the sentences in (2.7):

- (2.7)a Everybody in some Italian city met John
 b John met everybody in some Italian city

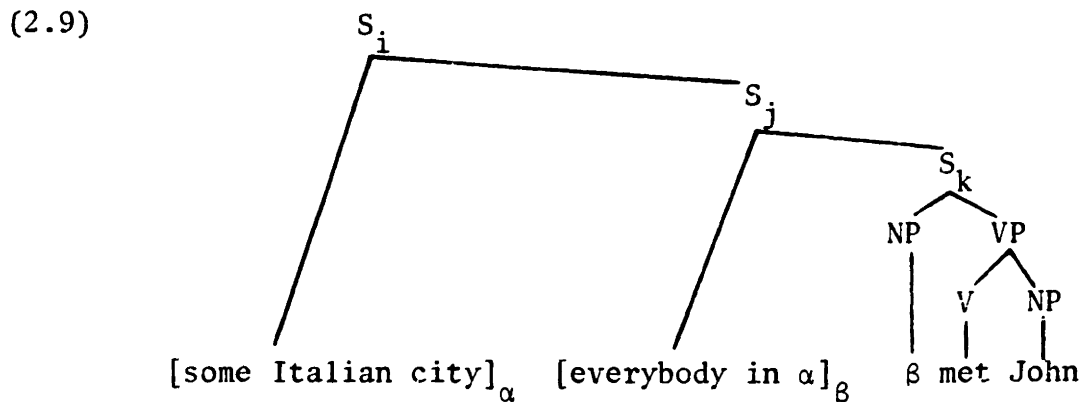
(2.7)a is unambiguous, only having an interpretation, captured by the logical form (2.2), where 'some' is understood as having wider scope than 'every'.

(2.7)b, on the other hand, is triply ambiguous. One interpretation parallels that of (2.7)a. On this interpretation, (2.7)b is true just in case John met all of the inhabitants of a particular Italian city, for example, Florence. Here 'some' is understood as having wider scope than 'every'. (2.7)b also has another reading where 'some' is understood as having wider scope. In this case, (2.7)b is true just in case John met all of a group of people in a particular Italian city, none of whom need have been inhabitants of that city. (2.7)b has in addition a reading in which 'every' is construed as having wider scope. On this interpretation, (2.7)b is true in a situation where John met Mary in Rome, Jack in Venice, Edward in Florence, etc. What these examples show is that there is an asymmetry in the range of possible interpretations for sentences containing NP-PP sequences, dependent upon whether the sequence occurs in subject or verb-complement position. If it occurs in the former position, the sentence is unambiguous, but if it occurs in the latter position, then the sentence is triply ambiguous.

How then, are these differences in the range of interpretations of NP-PP sequences to be explained? It is to answering this question that we now turn.

2.2 Nominal structure and linked logical forms. As was pointed out

above, sentences like those in (2.1) are associated with logical forms which are inversely linked, i.e., where only the quantified phrase with narrowest scope binds a variable in the main predicate. Thus, for example, sentence (2.1)a has associated with it the logical form (2.3), which is repeated here, in tree form, as (2.9):

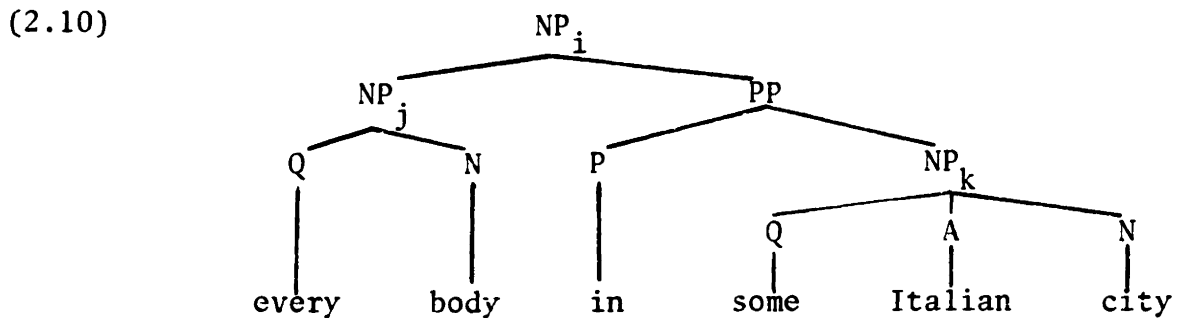


(2.9) is a well-formed logical form, since it satisfies both the Condition on Proper Binding and the Condition on Quantifier Binding. The former condition is satisfied because the variable ' α ' is c-commanded by the quantified phrase 'some Italian city', and the variable ' β ' is commanded by the quantified phrase 'everybody in α '. Since both of the variables in (2.9) are properly bound, the Condition on Proper Binding is satisfied. Furthermore, since the two quantified phrases binding these variables are the only quantified expressions in (2.9), it also satisfies the Condition on Quantifier Binding.

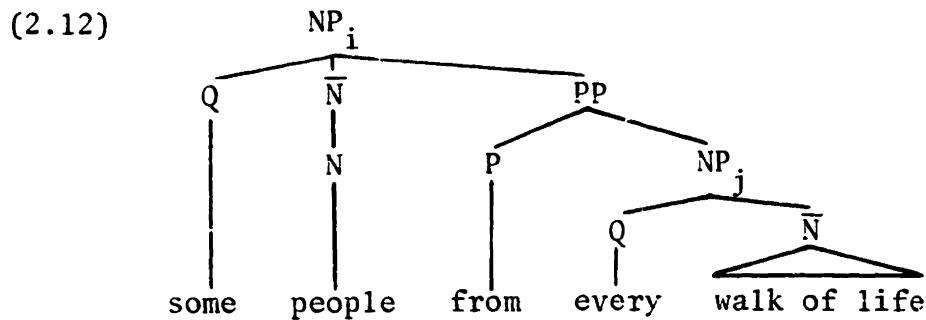
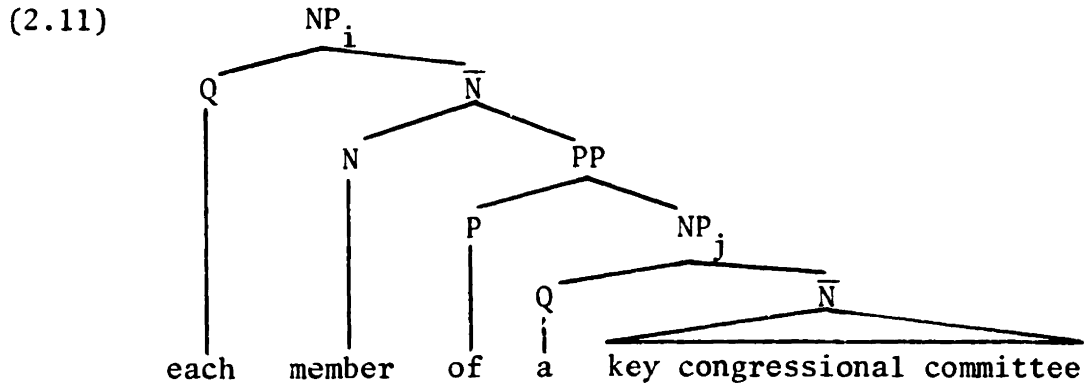
Structures like (2.9), in which the quantifiers are inversely linked, represent the unmarked case for PP-complement constructions. That is, inversely linked logical forms are the only structures generable, by

QR, from the surface structures of sentences like (2.1) and which satisfy the well-formedness conditions on logical forms. The remainder of this section will be devoted to proving this, by examining the derivation of logical forms for PP-complement structures.

To my knowledge essentially three different structures have been proposed as constituting the surface structure of PP-complement constructions. In (2.10), which has been advocated by Chomsky (1955), Emonds



(1976) and Reinhart (1976) among others, the initial quantifier and noun form a constituent noun phrase. This is in contrast to the other two structures which have been proposed, where the quantifier and the noun do not form a single constituent. (2.11) has been argued for by Wells (1945) and Chomsky (1970), and has been assumed as the structure of PP-complements in a number of recent studies, among them Jackendoff (1971), (1976), Akmajian (1975), Akmajian and Lehrer (1976) and Selkirk (1976). The third structure is (2.12), whose supporters have included Chomsky (1955), Jackendoff (1969), Selkirk (1970) and Akmajian and Heny (1975).



While there may be any number of arguments weighing on the possible existence of each of these structures,¹ what we shall see here is that regardless of which structure is assumed to be the surface structure of PP-complement constructions, the identical logical form is generated, (insofar as quantifier scope is concerned), from each of these structures. This result is of great interest, since it shows that in the case of quantification, questions of the form of noun phrases are independent of questions of their interpretation.

Let us consider first the structures in (2.11) and (2.12). Given the Condition on Analyzability, formulated in Chapter One,

Condition on Analyzability

If a rule ϕ mentions SPEC, then ϕ applies to the minimal [+N]-phrase dominating SPEC, which is not immediately dominated by another [+N]-phrase.

these structure are equivalent as far as the functioning of QR is concerned. This is because the Condition on Analyzability mandates that QR affect the minimal noun phrases in (2.11) and (2.12) which dominate the quantifiers, i.e., that it affect NP_i and NP_j in both cases. Given this identity in the functioning of QR in these two structures, we will continue the discussion of the derivation of the logical forms associated with these structures in terms of the \bar{N} -structure in (2.11).

Just as in the case of the simple transitive constructions studied in Chapter One, there is more than one way to derive a well-formed logical form from (2.11). One of these derivations is illustrated in (2.13), the other in (2.14):

- (2.13) $[S_i [NP_Q^{each} [\bar{N}^{member} [pp \text{ of } [NP_Q^a] [\bar{N}^{key \text{ cong. comm.}}]]]] \text{ voted for the amendment}] \rightarrow$
- $[S[a \text{ key cong. comm.}]_\alpha [S_i [NP_Q^{each} [\bar{N}^{member} [pp \text{ of } \alpha]]] \text{ voted for the amendment}]] \rightarrow$
- $[S[a \text{ key cong. comm.}]_\alpha [S^{[each \text{ member of } \alpha]}_\beta [S_i \beta \text{ voted for the amendment}]]]$

(2.14) $[S_i [_{NP} [_{Q \text{ each}}] [_{\bar{N} \text{ member}} [_{PP \text{ of}} [_{NP} [_{Q \text{ a}}] [_{\bar{N} \text{ key cong. comm.}}]]]]] \text{ voted for the amendment}] \rightarrow$

$[S [\text{each member of } [_{NP} [_{Q \text{ a}}] [_{\bar{N} \text{ key cong. comm.}}]]]_{\beta} [S_i^{\beta} \text{ voted for the amendment}]] \rightarrow$

$[S [\text{a key cong. comm.}]_{\alpha} [S [\text{each member of } \alpha]_{\beta} [S_i^{\beta} \text{ voted for the amendment}]]]$

Notice that the logical forms derived by QR in (2.13) and (2.14) are identical. While these derivations show that inversely linked logical forms are generable from an \bar{N} -structure by QR, which, as was pointed out above, satisfy the well-formedness conditions on logical forms, it is possible to establish an even stronger result: That these are the only logical forms derivable from a structure like (2.11) which satisfies these conditions. To see this, consider (2.15) and (2.16), which are the other derivations possible, via QR, from (2.11):

(2.15) $[S_i [_{NP} [_{Q \text{ each}}] [_{\bar{N} \text{ member}} [_{PP \text{ of}} [_{NP} [_{Q \text{ a}}] [_{\bar{N} \text{ key con. comm.}}]]]]] \text{ voted for the amendment}] \rightarrow$

$[S [\text{a key cong. comm.}]_{\alpha} [S_i [_{NP} [_{Q \text{ each}}] [_{\bar{N} \text{ member}} [_{PP \text{ of } \alpha}]]] \text{ voted for the amendment}]] \rightarrow$

$*[S [\text{each member of } \alpha]_{\beta} [S [\text{a key cong. comm.}]_{\alpha} [S_i^{\beta} \text{ voted for the amendment}]]]$

(2.16) $[S_i [_{NP} [_{Q \text{ each}}] [_{\bar{N} \text{ member}} [_{PP \text{ of}} [_{NP} [_{Q \text{ a}}] [_{\bar{N} \text{ key cong. comm.}}]]]]] \text{ voted for the amendment}] \rightarrow$

$[S [\text{each memner of } [_{NP} [_{Q \text{ a}}] [_{\bar{N} \text{ key cong. comm.}}]]]_{\beta} [S_i^{\beta} \text{ voted for the amendment}]] \rightarrow$

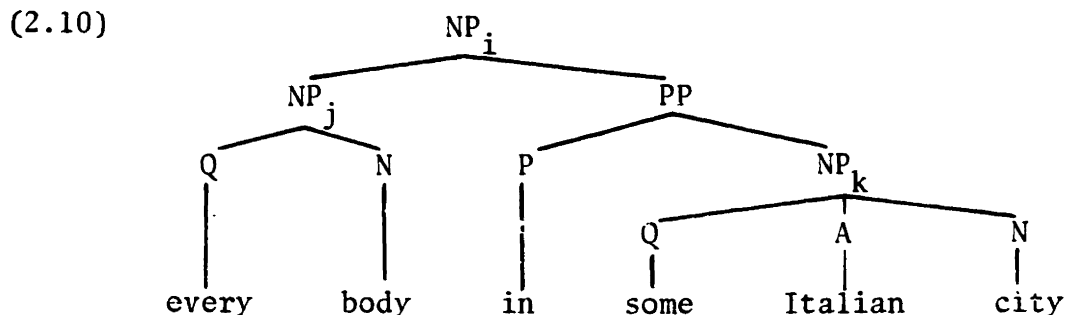
$*[S [\text{each member of } \alpha]_{\beta} [S [\text{a key cong. comm.}]_{\alpha} [S_i^{\beta} \text{ voted for the amendment}]]]$

Once again, the structures generated under both of these derivations

are identical, but, in this case, the scope order of the quantifiers is reversed, as compared to the structure derived in (2.13) and (2.14). Thus, in the structure generated in the derivations (2.15) and (2.16), 'each' has wider scope than 'a'. The structure generated by these derivations, though, is not a well-formed logical form, since it contains a variable which is not properly bound. This is because the variable ' α ' is not c-commanded by the noun phrase 'a key congressional committee' which binds it; rather, the binding noun phrase is itself c-commanded by the variable. This means that ' α ' is not properly bound, thus violating the Condition on Proper Binding.

The deviance of the structure generated by the derivations (2.15) and (2.16) shows, then, that the only logical form which it is possible to generate, by QR, from a structure such as (2.11) is one which is inversely linked. The other structure which is derivable, in which the quantifier which is embedded in surface structure has narrower scope, is not a logical form, since it does not satisfy the Condition on Proper Binding.

The third structure for PP-complement constructions that we mentioned above is (2.10), repeated here:



This structure differs from those in (2.11) and (2.12) in that the initial quantifier and noun, here 'every' and 'body' form a constituent noun phrase. However, this does not alter the characteristic interpretation of the construction, as far as scope of quantification is concerned. That is, just as the structures (2.11) and (2.12) are associated with inversely linked logical forms, so is the structure (2.10). The reason for this lies in the Condition on Analyzability, which, as was noted in Chapter One, is independently motivated. Recall that this condition mandates that QR affect the minimal NP dominating SPEC, which is not itself immediately dominated by another NP. In (2.10), where 'every' satisfied the term Q of QR, the NP satisfying this description is NP_i , which immediately dominates NP_j . Since NP_i is also the noun phrase affected by QR in the derivations from (2.11) and (2.12), the identical structure is derived from (2.10) as from (2.11) or (2.12). As an illustration, consider the derivation in (2.17), which is parallel to the derivation in (2.14). The

$$\begin{aligned}
 (2.17) \quad & [S_i [NP [NP [Q \text{ every}] \text{ body}] [PP \text{ in } [NP [Q \text{ some}] \text{ Italian city}]]] \text{ met John}] \rightarrow \\
 & [S [\text{some Italian city}]_\alpha [S_i [NP [NP [Q \text{ every}] \text{ body}] [PP \text{ in } \alpha]] \text{ met John}]] \rightarrow \\
 & [S [\text{some Italian city}]_\alpha [S [\text{everybody in } \alpha]_\beta [S_i^\beta \text{ met John}]]]
 \end{aligned}$$

structure which is derived in (2.17) is a well-formed logical form, since it satisfies both the Condition on Proper Binding and the Condition on Quantifier Binding.

It is clear from the derivation in (2.17), that the logical form

generated from structure (2.10) has the same formal properties as the logical forms generated from (2.11) and (2.12); they are all inversely linked logical forms, in which the narrower scope quantifier binds a variable in the main predicate. What this result shows is that in the case of case of PP-complement constructions containing quantifiers, matters of noun phrase structure are independent of matters of noun phrase interpretation, since the same logical form is generated, regardless of which structure is assumed to be the appropriate surface structure for this construction. The wider ramifications of this result will be discussed in section 2.6 of this chapter, in the context of determining the nature of the logical form associated with relative clause constructions.

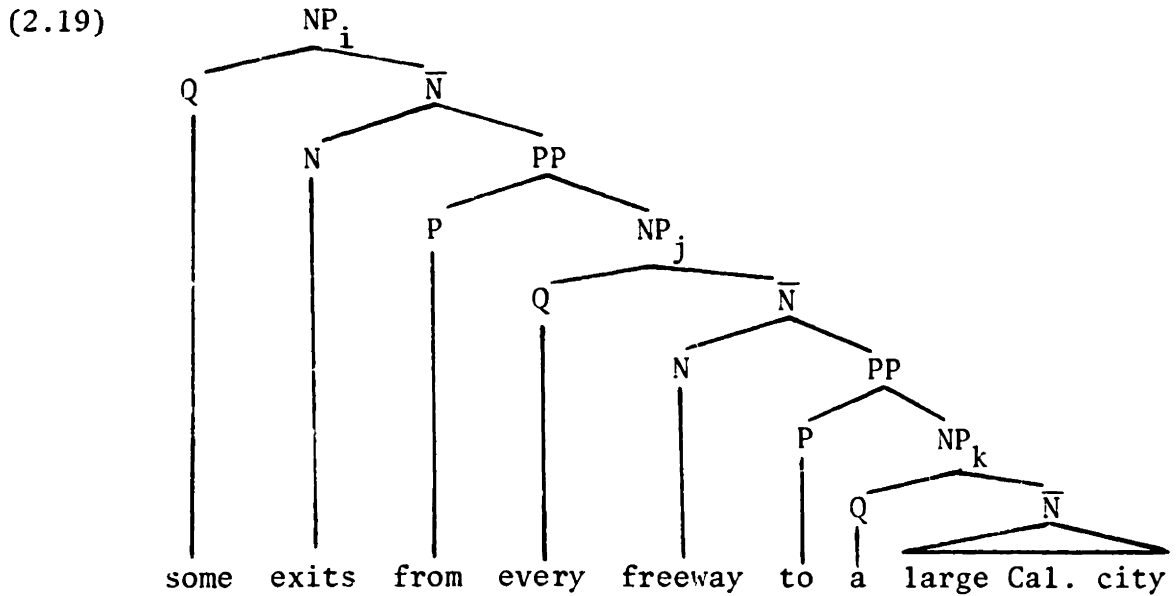
Before concluding this discussion of the logical properties of PP-complement constructions in subject position, recall that we noted that these constructions are associated with inversely linked logical forms, regardless of the depth of prepositional phrase embeddings. Thus, just as the sentences in (2.1) were unambiguous, so are those in (2.2). Associated with sentence (2.2)a is the logical form (2.18):

(2.2)a Some exits from every freeway to a large
 California city are badly constructed

(2.18) $[_S[a \text{ large California city}]_{\alpha} [_S[\text{every freeway to } \alpha]_{\beta}$
 $[_S[\text{some exits from } \beta]_{\gamma} [_S\gamma \text{ are badly constructed}]]]]$

The only difference between the derivation of the logical form of (2.2)a, from the surface structure in (2.19), and the derivations of logical forms

for sentences like those in (2.1) is that there exist more equivalent derivations of the logical form associated with the more complex sentence. Thus,



while there were two equivalent derivations for sentences such as (2.1), which contain two quantifiers, there are six (three factorial) equivalent derivations of (2.2), which contains three quantifiers. In (2.20), we give one of the derivations of (2.2). It is left to the reader to distinguish the other five, and to see that the result of any other derivation does not satisfy the well-formedness conditions on logical forms.

(2.20) $[S_i [NP [Q \text{ some}] [\bar{N} \text{ exits } [PP \text{ from } [NP [Q \text{ every}] [\bar{N} \text{ freeway } [PP \text{ to } [NP [Q \text{ a}] [\bar{N} \text{ large Cal. city}]]]]]]]]]] \text{ are badly constructed}] \rightarrow$
 $[S [some \text{ exits } [PP \text{ from } [NP [Q \text{ every}] [\bar{N} \text{ freeway } [PP \text{ to } [NP [Q \text{ a}] [\bar{N} \text{ large Cal. city}]]]]]]]]_\gamma [S_i \gamma \text{ are badly constructed}]] \rightarrow$

$$\begin{aligned}
& [{}_S[\text{every freeway to } [{}_{NP}[Q^a][\bar{N}\text{-large Cal. city}]]]_{\beta} [{}_S[\text{some} \\
& \quad \text{exits from } \beta]_{\gamma} [{}_S[{}_{\gamma} \text{ are badly constructed}]]] \quad \rightarrow \\
& [{}_S[\text{a large Cal. city}]_{\alpha} [{}_S[\text{every freeway to } \alpha]_{\beta} [{}_S[\text{some} \\
& \quad \text{exits from } \beta]_{\gamma} [{}_S[{}_{\gamma} \text{ are badly constructed}]]]]
\end{aligned}$$

In this section, then, we have seen that the fact that sentences containing PP-complements, of any depth of embedding, are always associated with an inversely linked logical form, is explained on the basis of our assumptions about the functioning of QR and the nature of the universal well-formedness conditions on logical forms. As such, the inversely linked logical structure represents the unmarked case in the interpretation of sentences containing PP-complement structures.

2.3 Post-verbal NP-PP constructions. At the beginning of this chapter, it was noted that sentence (2.7)b, repeated here, is triply ambiguous, in marked contrast to the unambiguity of (2.7)a. Recall that while

- (2.7)a Everybody in some Italian city met John
 b John met everybody in some Italian city

(2.7)a asserts that there is an Italian city, such that all of the people in it met John, (2.7)b may be taken as asserting (i) that John met all of the inhabitants of a particular Italian city; (ii) that John met all of the members of some group, say, in a particular city in Italy, none of whom need have been inhabitants of that city; or (iii) that each of the members of a group were met by John in a city in Italy, where the city may be different for each individual; John may have met Harry in Rome,

Jack in Venice, Edward in Florence, etc. Readings (i) and (ii) are related, in that in both cases the quantifier 'some' is construed as taking wider scope than 'every', while in reading (iii) 'every' is construed as having wider scope than 'some'. The (ii) and (iii) readings are also related, in that they are represented by non-linked logical forms, while the (i) reading is represented by an inversely linked logical form. How then, are these differences in the range of interpretations of (2.7)b, as opposed to (2.7)a, to be explained?

At first blush, the only apparent difference between (2.7)a and (2.7)b is that the pre- and post-verbal strings have been inverted. This difference, though, belies a deeper structural difference between the two sentences. If an NP-PP sequence occurs in subject position, as in (2.7)a, then it must be a PP-complement construction. This is because the subject position always consists of a single noun phrase constituent, and as we have just seen, it is only possible to generate an inversely linked logical form from PP-complement structures. When an NP-PP sequence appears in object position though, they need not form a constituent; verb phrases of the form in (2.21) are well-formed:

$$(2.21) \quad [_{VP}[V \dots][_{NP} \dots][_{PP} \dots]]$$

In verb phrases of this structure, the prepositional phrase complement is always optional: compare 'John bought a book' vs. 'John bought a book for Mary', 'John met Harry' vs. 'John met Harry in the bar', etc. Thus, any verb which is subcategorized to appear in a structure of the form

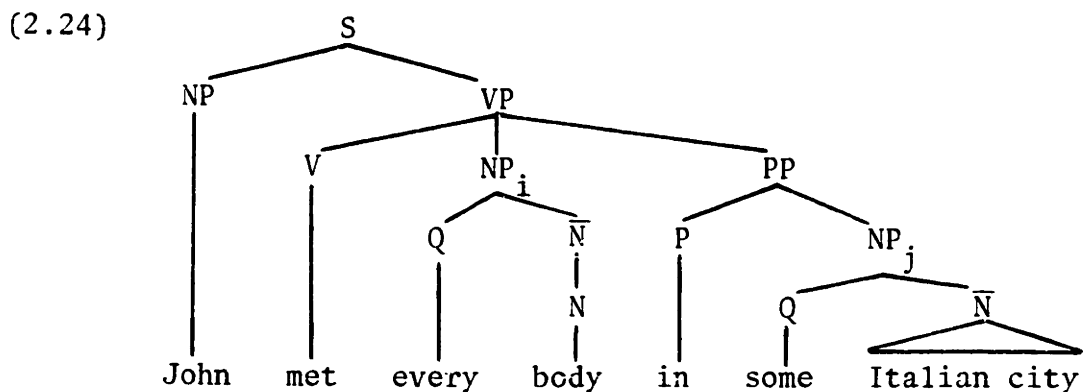
(2.21) may also appear in (2.22):

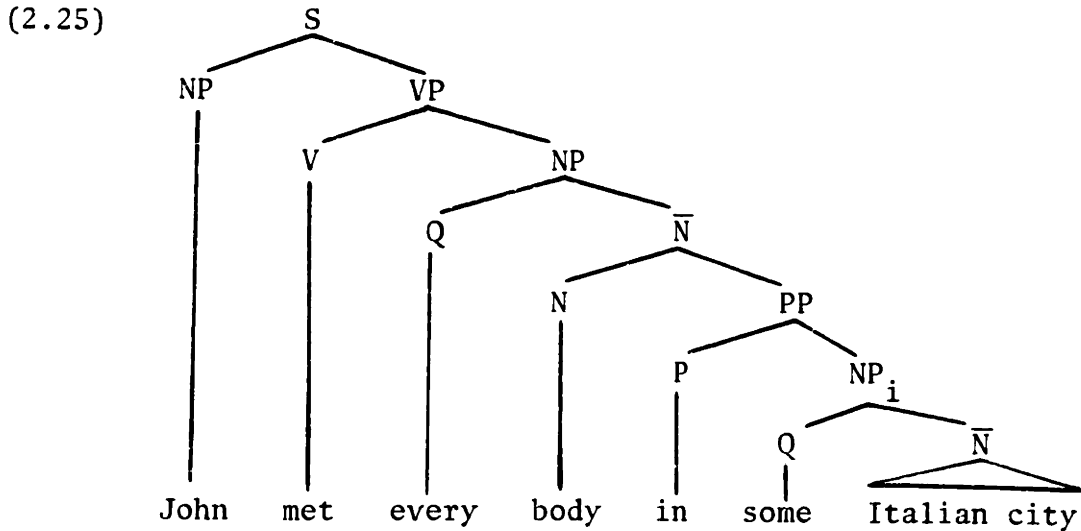
(2.22) $[_{VP}[_V\cdots] [_{NP}\cdots]]$

But, given the existence of this structure, the structure in (2.23) also represents a possible verb phrase, because of the independent necessity

(2.23) $[_{VP}[_V\cdots] [_{NP}[_Q\cdots] [_{\bar{N}}[_{N}\cdots] [_{PP}\cdots]]]]^2$

of a phrase structure rule for NP, generating PP-complement constructions. Therefore, any verb which may be followed by a noun phrase and a prepositional phrase which do not form a constituent, as in (2.21), may also occur in a structure in which the noun phrase and the prepositional phrase do form a constituent, as in (2.23) (but cf. discussion of dative constructions below). Sentences such as (2.7)b, where an NP-PP sequence follows the verb are thus systematically ambiguous with regard to their surface structures: (2.24) and (2.25) are the possible surface structures of (2.7)b:





The existence of these two distinct structures as surface structures of (2.7)b, is attested to by the possibility of associating two passive sentences with the active (2.7)b:

- (2.26)a Everybody in some Italian city was met by John
 b Everybody was met in some Italian city by John

Interestingly, neither (2.26)a nor (2.26)b exhibits the same range of ambiguity as (2.27)b. (2.26)b only has a reading corresponding to the (i) reading of (2.7)b described above, while (2.26)a is ambiguous, having readings which correspond to the (ii) and (iii) readings of (2.7)b. The reason for this will become apparent momentarily.

These two structures have much in common with the types of structures we have discussed up to this point. (2.25) contains a PP-complement, from which it is only possible to derive a single logical form, in which the quantifiers are inversely linked. Thus, the logical form generable by QR from (2.25) is (2.27):

$$(2.27) \quad [_S[\text{some Italian city}]_\alpha \ [_S[\text{everybody in } \alpha]_\beta \\ [_S[\text{John met } \beta]]]]$$

Notice that (2.27) is the only well-formed representation at Logical Form which can be derived from (2.25); a logical form which corresponds to a reading in which 'every' is understood as having scope wider than 'some' is excluded, since it would violate the Condition on Proper Binding, as shown in (2.28):

$$(2.28) \quad *[_S[\text{everybody in } \alpha]_\beta \ [_S[\text{some Italian city}]_\alpha \\ [_S[\text{John met } \beta]]]]$$

In (2.28) the variable ' α ', which is the object of the preposition, is not properly bound, since it is not c-commanded by the 'some' phrase. Thus, just as in the cases discussed in section 2.2, it is not possible to associate a structure containing a PP-complement, here in object position, with a logical form which is naturally linked; it is only possible to associate them with inversely linked logical forms.

(2.24), on the other hand, is essentially the type of structure discussed in Chapter One, where two simple quantified noun phrases which do not form a single NP constituent occur in a single clause sentence. The only difference is that, while in the constructions discussed in Chapter One one of the noun phrases was the subject, and the other an object, here both noun phrases are verbal complements. QR functions in quite the same way as it did for the simple transitive structures in

generating logical forms from (2.24), allowing for the generation of two distinct non-linked logical forms. One of these, in which the quantifiers are inverted, vis-a-vis (2.24), is illustrated in (2.29), and the other, in which the quantifiers are in natural order, is shown in (2.30).

$$(2.29) \quad [{}_S[\text{some Italian city}]_\alpha [{}_S[\text{everybody}]_\beta \\ [{}_S[\text{John met } \beta \text{ in } \alpha]]]]$$

$$(2.30) \quad [{}_S[\text{everybody}]_\beta [{}_S[\text{some Italian city}]_\alpha \\ [{}_S[\text{John met } \beta \text{ in } \alpha]]]]$$

A derivation of (2.29) from (2.24) is illustrated in (2.31), while a derivation of (2.30) is illustrated in (2.32):

$$(2.31) \quad [{}_S[\text{John } [{}_{VP}[\text{met } [{}_{NP}[_Q\text{every}] \text{ body}][{}_{PP}[\text{in } [{}_{NP}[_Q\text{some}] \\ \text{Italian city}]]]]]] \rightarrow \\ [{}_S[\text{everybody}]_\beta [{}_S[\text{John } [{}_{VP}[\text{met } \beta [{}_{PP}[\text{in } [{}_{NP}[_Q\text{some}] \text{ Italian} \\ \text{city}]]]]]] \rightarrow \\ [{}_S[\text{some Italian city}]_\alpha [{}_S[\text{everybody}]_\beta [{}_S[\text{John met } \beta \text{ in} \\ \alpha]]]]$$

$$(2.32) \quad [{}_S[\text{John } [{}_{VP}[\text{met } [{}_{NP}[_Q\text{every}] \text{ body}][{}_{PP}[\text{in } [{}_{NP}[_Q\text{some}] \\ \text{Italian city}]]]]]] \rightarrow \\ [{}_S[\text{everybody}]_\beta [{}_S[\text{John } [{}_{VP}[\text{met } \beta [{}_{PP}[\text{in } [{}_{NP}[_Q\text{some}] \\ \text{Italian city}]]]]]] \rightarrow$$

$$[_S[\text{everybody}]_{\beta} [_S[\text{some Italian city}]_{\alpha} [_S\text{John met } \beta \text{ in } \alpha]]]$$

It is clear that the three logical forms (2.27), (2.29) and (2.30) correspond to the (i), (ii) and (iii) readings described above for sentence (2.7)b, respectively. The ambiguities of sentences containing post-verbal NP-PP sequences follows, therefore, from being able to generate, from the surface structures like (2.24) and (2.25), three distinct well-formed logical forms.

Returning to the passive constructions, (2.26), their relationship to their active counterpart, (2.7)b, is a function of whether it is a passive of (2.24) or (2.25). In (2.26)a, the passive subject is the PP-complement which is the active object in (2.25). Therefore, just as it is only possible to generate an inversely linked logical form from (2.25), it is also only possible to generate this type of logical form from the surface structure of (2.26)a. In (2.26)b, though, the two noun phrases do not form a single noun phrase constituent, since this is the passive of the structure in (2.24). This makes it possible to generate two logical forms from the surface structure of (2.26)b, which are equivalent to the logical forms generated from (2.24).

Besides the passives in (2.26), there are other passive constructions which are similar to (2.7)b. In particular, consider sentence (2.33), where 'by everybody in some Italian city' forms a single constituent, and,

(2.33) John was met by everybody in some Italian city

like (2.7)a, is unambiguous. This means that the NP-PP sequence in (2.33) is a PP-complement construction, from which it is only possible to generate the logical form in (2.34), which is equivalent to (2.3).³

(2.34) $[_S[\text{some Italian city}]_\alpha [_S[\text{everybody in } \alpha]_\beta$
 $[_S[\text{John was met by } \beta]]]$

Not all sentences containing post-verbal NP-PP sequences exhibit the surface structure ambiguities of (2.7)b. The dative construction, illustrated in (2.35), is a case in which the noun phrase and the prepositional phrase do not form a constituent, having a surface structure

(2.35)a Elvis bought a Cadillac for everyone
 b Sam gave some lessons to all of the students

as in (2.24). This is shown by the fact that the sentences in (2.35) only have, as their passive counterparts, the sentences in (2.36), and not those

(2.36)a A Cadillac was bought for everyone by Elvis
 b Some lessons were given to all of the students by Sam

in (2.37):⁴

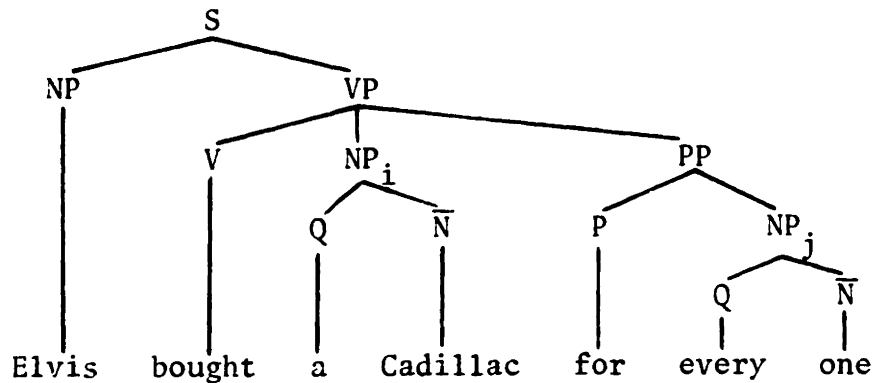
(2.37)a *A Cadillac for everyone was bought by Elvis
 b *Some lessons to all of the students were given by Sam

The sentences in (2.35), as opposed to (2.7)b, are two, rather

than three, ways ambiguous. (2.35)a may be taken as asserting either (i) that there is a single Cadillac, such that Elvis bought it for everyone, or (ii), that for each person, Elvis bought them their own Cadillac. Similarly, in (2.35)b, it is being asserted either (i) that there are lessons, such that Sam gave them to all of the students, as a group, or (ii), that Sam gave each of the students some private lessons.

The fact that the sentences in (2.35) are two ways ambiguous follows from the dative construction only having a surface structure, illustrated in (2.38) for (2.35)a, in which NP_i and PP do not form a

(2.38)



constituent. This means that QR may generate two logical forms for (2.35)a: (2.39)a in which 'a' takes a wider scope, and (2.39)b, in which 'every' takes wider scope:

- (2.39)a $[_S[a \text{ Cadillac}]_\beta [_S[\text{everyone}]_\alpha [_S\text{Elvis bought } \beta \text{ for } \alpha]]]$
 b $[_S[\text{everyone}]_\alpha [_S[a \text{ Cadillac}]_\beta [_S\text{Elvis bought } \beta \text{ for } \alpha]]]$

These two logical forms correspond to the scope ambiguities described

above as accruing to (2.35)a. The reading which this sentence lacks, as compared to (2.7)b, is the linked reading. This is because dative constructions do not have surface structures in which the NP-PP sequence is a PP-complement construction, as witnessed by the deviance of the passives in (2.37).

This ambiguity is maintained in the double-object dative construction, illustrated by the sentences in (2.40):

- (2.40)a Elvis bought everyone a Cadillac
 b Sam gave all of the students some lessons

These sentences have a surface structure, shown in (2.41) for (2.40)a, in which the two post-verbal noun phrases do not form a noun phrase constituent.

- (2.41) $[_S \text{Elvis} [_{VP} \text{bought} [_{NP_j} \text{everyone}] [_{NP_i} \text{a Cadillac}]]]$

This makes it possible to generate, by QR, two distinct, well-formed non-linked logical forms from this structure. They are illustrated in (2.42):

- (2.42)a $[_S [_{a \text{ Cadillac}}]_{\beta} [_S [\text{everyone}]_{\alpha} [_S \text{Elvis bought } \alpha \ \beta]]]$
 b $[_S [\text{everyone}]_{\alpha} [_S [_{a \text{ Cadillac}}]_{\beta} [_S \text{Elvis bought } \alpha \ \beta]]]$

In (2.42)a, the quantifier 'a' takes wider scope than the quantifier 'every'; in (2.42)b, the scope relations are reversed. These logical forms are equivalent to (2.39)a and (2.39)b, respectively.

2.4 Wh-constructions. Up to this point we have seen that on the basis of our assumptions about the functioning of QR, and the nature of the well-formedness conditions on logical forms, it is possible to explain the range of interpretation open to sentences containing NP-PP sequences. In particular, it has been pointed out that there are distinct differences between whether the NP-PP sequence appears either pre- or post-verbally, in subject or verb complement position. There is another position, though, in which PP-complement constructions can occur in surface structure; namely in the pre-clausal COMP position. These structures, as for example in (2.42), arise from applications of the rule of wh-movement.

(2.43) Which men in Cleveland did you meet?

The interesting property of PP-complement constructions occurring in COMP position is that a quantified noun phrase may not occur as the object of the preposition; e.g., the deviance of (2.44) as compared to (2.43).

(2.44) *Which men in some city did you meet?

On the usual assumptions concerning the nature of wh-movement, there is no way to account for the difference between these two sentences. This is because wh-movement functions identically in both cases, affecting the entire PP-complement construction headed by the wh-words, and moving it into COMP position. How then, is the difference in acceptability between (2.43) and (2.44) to be explained? In this section, it will be argued that

the explanation lies in the functioning of QR in structures to which wh-movement has applied. This interaction will also explain a number of other gaps in the distribution of wh-constructions, which are not explicable on the basis of our assumptions about the generation of their surface structures.

In what follows, we will be assuming an analysis of wh-constructions along the lines proposed in Chomsky (1973), (1977a). Under this theory, wh-constructions such as direct and indirect questions and relative clauses, are generated by a rule of wh-movement, stated as:

Move wh

whose functioning is governed, as is QR's, by the Condition on Analyzability, repeated here:

Condition on Analyzability

If a rule ϕ mentions SPEC, then ϕ applies to the minimal [+N]-phrase dominating SPEC, which is not immediately dominated by another [+N] phrase

The particular aspects of the analysis of wh-constructions which will concern us here are (i), that wh-movement is subject to the trace theory of movement rules, and (ii), that this rule functions to move a wh-phrase into COMP position. As an example of the sort of structure generated by wh-movement, consider (2.45):

(2.45) $[\bar{S}[\text{COMP}^{\text{which instrument}}]_t [\text{S}^{\text{does Cecil play } t}]]$

(2.45) is a representation not only at the level of Surface Structure, but also at Logical Form, since the relationship of a wh-phrase and the trace which it binds is, in general, unaltered by rules mapping from Surface Structure to Logical Form. This structure, therefore, must satisfy the well-formedness conditions on representations at Logical Form, in particular, the Condition on Proper Binding. (2.45), for instance, satisfies this condition, as the first branching node dominating COMP, which is \bar{S} , also dominates 't'. Since this variable is c-commanded by the phrase which binds it, it is properly bound. Notice that it is not always the case that the surface structures generated by wh-movement are identical to their logical forms. If a surface structure contains other quantified noun phrases in addition to the wh-phrase, then QR will apply in generating the logical form with which it is associated. It should be kept in mind that in such cases, to which we will turn shortly, applications of wh-movement to a structure will always precede applications of QR. This is simply a consequence of wh-movement being a rule which maps from Deep Structure to Surface Structure, while QR maps from Surface Structure to Logical Form.

Our main concern in examining the relationship of wh-movement and QR will center around direct question constructions. In these structures, it has often been held, (for example, by Hiž (1962); Belnap (1963); Chomsky (1976) and Sag (1976)), that the wh-word functions as a quantifier. When this assumption is taken in conjunction with the properties of QR, it

follows that the wh-quantifier is the maximally wide scope quantifier, with respect to other "normal" quantifiers, like 'every', 'some', 'many', etc., in a sentence. To see this, consider (2.45):

(2.46) $[\bar{S}_{COMP^e}[_S \text{John recorded } [_{NP} \text{one song}]_{PP} \text{on } [_{NP} \text{every album}]]]$

('e' signifies that the category COMP is lexically empty in this structure.)

(2.46) is ambiguous,⁵ having a reading in which it is asserted that there is a particular song, perhaps John's theme song, which he recorded on all of the albums he made, and a reading where it is asserted that each of his albums contains but a single song, encompassing both sides of the disc. This ambiguity is a function of the fact that it is possible to associate a structure such as (2.46) with two distinct logical forms, as we have seen in the previous section. The logical form in (2.47) corresponds to the former reading, the logical form in (2.48) to the latter reading:

(2.47) $[_S[\text{one song}]_\alpha [_S[\text{every album}]_\beta [_S \text{John recorded } \alpha \text{ on } \beta]]]$

(2.48) $[_S[\text{every album}]_\beta [_S[\text{one song}]_\alpha [_S \text{John recorded } \alpha \text{ on } \beta]]]$

From the structure of (2.46), it is possible to generate two wh-structures. (2.49)a arises from wh-movement affecting the direct object in (2.46), (2.49)b from this rule affecting the object of the preposition:

(2.49)a $[\bar{S}_{COMP}^{\text{which song}}]_t [_S \text{did John record } t \text{ on every album}]$

b $[\bar{S}_{COMP}^{\text{which album}}]_t [_S \text{did John record one song on } t]$

Both of these sentences are unambiguous, each representing a questioning of one of the readings of (2.46). Thus, to (2.49)a, which corresponds to the reading of (2.46) captured by (2.47), an appropriate reply must provide information about a song which appears on all of John's albums. For example, one could felicitously reply to (2.49)a 'his theme song', or 'Giant Steps'. (2.49)b corresponds to the reading of (2.46) which is expressed by (2.48). Therefore, answers to it must convey information about those albums on which John only recorded a single song. In this case, replies like 'his latest release', or 'everyone of them', would be appropriate.⁶ The questions in (2.49), then, are each questioning one of the readings of (2.46): (2.49)a the reading expressed by (2.47), and (2.49)b, the reading expressed by (2.48).

The unambiguous nature of the direct questions in (2.49), is a reflection of the fact that it is only possible to associate them with one logical form each. The reason for this lies in the functioning of QR. Recall that QR functions to adjoin quantified noun phrases to S (and not to \bar{S}). Therefore, in structures like those in (2.49), which only contain a single S node, there is only one possible site for QR to adjoin a noun phrase. Thus, the logical form generable from (2.49)a and (2.49)b are (2.50)a and (2.50)b, respectively:

(2.50)a $[\bar{S}[_{COMP} \text{which song}]_t [_S [\text{every album}]_\beta [_S \text{did John record } t \text{ on } \beta]]]$

b $[\bar{S}[_{COMP} \text{which album}]_t [_S [\text{one song}]_\alpha [_S \text{did John record } \alpha \text{ on } t]]]$

The relationship of each of the questions in (2.49) to the ambiguities of (2.46) is immediately apparent from comparing (2.50)a to (2.47) and (2.50)b to (2.48). Given the formal identity of these pairs of logical forms, it is clear why (2.49)a is the questioning of the reading of (2.46) represented by (2.47), and (2.49)b the questioning of the reading represented by (2.48).⁷

What the logical forms in (2.50) further show is that wh is the maximally wide scope quantifier. Thus, by definition, wh has wider scope than 'every' in (2.50)a and wider scope than 'some' in (2.50)b, since in each case the wh-quantifier c-commands the other quantifier. Since logical forms like those in (2.50) are the only ones generable from the surface structures in (2.49), given our assumptions about QR and wh-movement, it follows, as a consequence of the analysis, that wh is the widest scope quantifier, vis-a-vis other quantifiers in the sentence.⁸

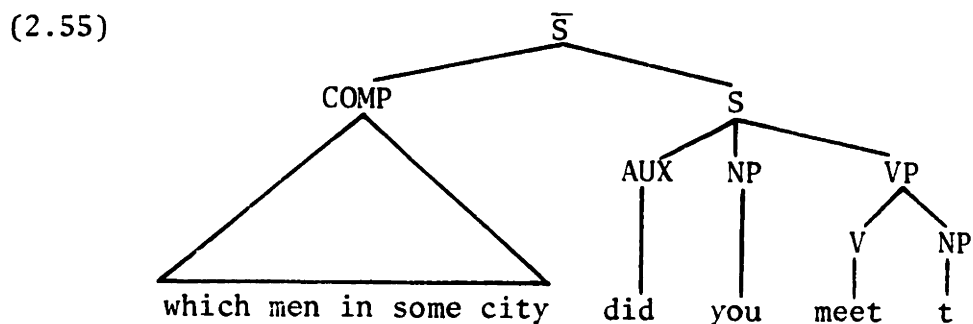
In the sentences which we have been discussing, the wh-phrase and the quantified noun phrase do not form a single constituent, rather, they are each simple noun phrases. When a wh-phrase and a quantified noun phrase form a PP-complement construction, however, the range of possible wh-constructions is significantly restricted, as examples (2.43) and (2.44), pointed out above, show. These examples are repeated here, along with a number of other cases exhibiting the same phenomena:

- (2.51)a Which men in Cleveland did you meet?
 b *Which men in some city did you meet?

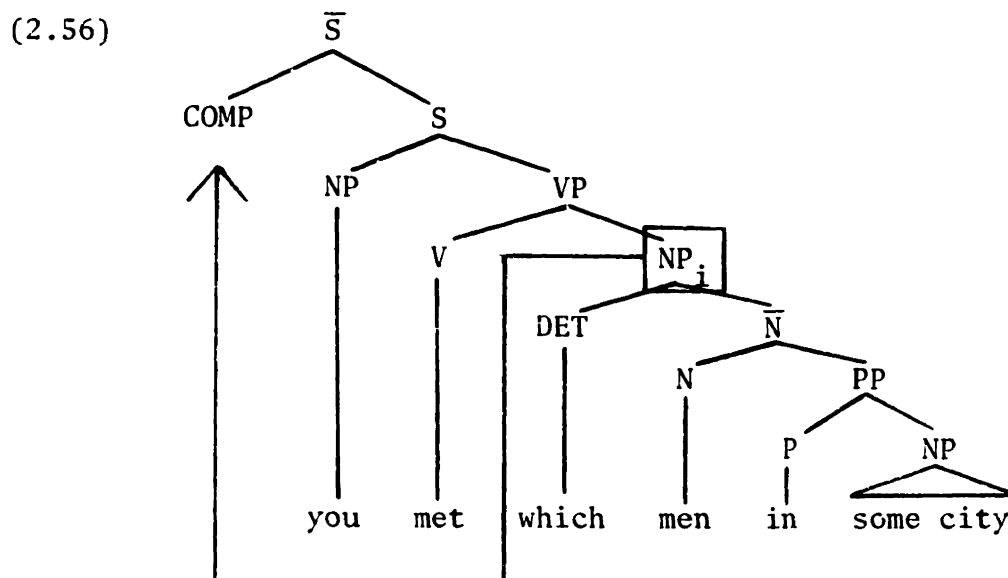
- (2.52)a Which car in the garage is Harry keeping?
 b *Which car in a garage is Harry keeping?

- (2.53)a Which painting from John's collection do you want?
 b *Which painting(s) from everyone's collection do you want?
- (2.54)a Which pictures of my friends did John see?
 b *Which pictures of many friends did John see?

The difference between the well-formed (a) sentences, and the ill-formed (b) sentences is that the latter contain quantifiers in a position where the former contain referring expressions. Therefore, in the (b) cases, QR must apply in order to generate well-formed logical forms for these sentences, since otherwise the Condition on Quantifier Binding would not be satisfied. As an example of the generation of logical forms for the (b) examples, consider (2.55), which is the surface structure of (2.51)b:



(2.55) is generated, from the structure in (2.46), by wh-movement applying to NP_i :



In order to generate a logical form from the surface structure in (2.55), QR must apply to the quantified noun phrase, 'some city', which is embedded in COMP. As we noted above, there is only one S in this structure, to which QR may adjoin this phrase, generating (2.57):

$$(2.57) \quad [\bar{S}_{COMP}^{which\ men\ in\ \alpha}]_t \ [S_j^{[some\ city]}]_{\alpha} \ [S_i^{did\ you\ meet\ t}]]$$

(2.57), though, is not a well-formed logical form, since it violates the Condition on Proper Binding. This is because the first branching node dominating 'some city' is S_j , which does not dominate ' α '. Since ' α ' is not c-commanded by the quantified noun phrase which binds it, it is not properly bound. (2.57), therefore, contains a variable which is not properly bound, and, hence, violates the Condition on Proper Binding.⁹

In contrast to this state of affairs, the logical forms associated with the (a) examples in (2.51) - (2.54) are all well-formed. For example, consider (2.58), which is the logical form associated with (2.51)a. Since

(2.58) $[\bar{S}[\text{COMP}^{\text{which men in Cleveland}}]_t [\text{S}^{\text{did you meet t}}]]$

(2.51)a contains a referring expression in the position of the quantifier phrase in (2.51)b, QR does not apply in the generation of its logical form. Therefore, the structure of the logical form associated with the (a) examples in (2.51) - (2.54) is essentially identical for their surface structures. (2.53) is a well-formed logical form, since it satisfies both the Condition on Quantifier Binding and the Condition on Proper Binding. The former condition is satisfied because the only quantifier in (2.58), which is wh, properly binds the variable 't', which it c-commands, while the latter Condition is satisfied because 't', which is the only variable in (2.58), is properly bound by the wh-quantifier.

The distribution of wh-constructions illustrated by the examples in (2.51) - (2.54) is explained, then, by the fact that it is only the logical forms associated with the (a) sentences, containing referential expressions, which are well-formed; those associated with the (b) examples, which contain quantifier phrases, though, are ill-formed, since the only logical form which can be derived from their surface structure violates the Condition on Proper Binding.¹⁰

In sentences (2.51)b - (2.54)b, the quantifier is embedded in surface structure in the prepositional phrase complement to the head wh-word. If the situation is reversed, though, with the wh-phrase embedded as the object of the preposition, the result is no more acceptable.¹¹

(2.59)a $*[\bar{S}[\text{COMP}^{\text{some people in which city}}]_t [\text{S}^{\text{did you meet t}}]]$

(2.59)b * $[\bar{S}_{COMP} \text{some people in which city}]_t [{}_S t \text{ voted for Debs}]$

The reason for the ill-formedness of these sentences is identical to the reason for the ill-formedness of those in (2.51)b - (2.54)b: It is not possible to generate logical forms from their surface structures which satisfy the well-formedness conditions on representations at Logical Form. Thus, consider the structures in (2.60), which are generated from (2.59)a and (2.59)b, respectively, by QR affecting the noun phrase 'some people in which city':

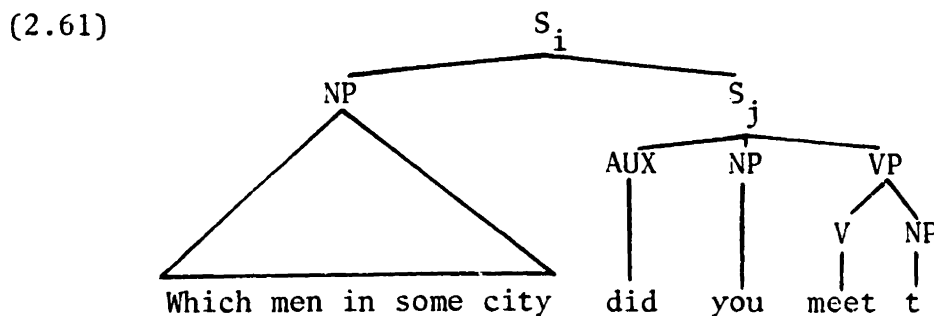
(2.60)a * $[\bar{S}_{COMP}^\alpha]_t [{}_S [\text{some people in which city}]_\alpha [{}_S \text{did you meet } t]]]$

b * $[\bar{S}_{COMP}^\alpha]_t [{}_S [\text{some people in which city}]_\alpha [{}_S t \text{ voted for Debs}]]]$

Neither of these structures is well-formed, since they both violate the Condition on Quantifier Binding. This is because neither 'some', (nor the wh-quantifier) in these structures properly binds a variable; 'some' does not c-command the variable, ' α ', which it binds, and the wh-quantifier simply no longer binds a variable in this structure. Notice that the structures in (2.60) do not violate the Condition on Proper Binding, since the only variable in an argument position, which is 't', is properly bound, by the (now empty) noun phrase in COMP position. Notice that the occurrence of ' α ' in COMP does not violate this condition, since COMP is not an argument position. The examples in (2.59), therefore, are ill-formed because it is not possible to associate them with logical

forms which are consistent with the Condition on Quantifier Binding.¹²

One of the most significant aspects of this explanation of the gaps in wh-constructions typified by the examples in (2.51)b - (2.54)b and (2.59), is that they are not a result of some defect in the functioning of wh-movement. Rather, the explanation lies in the fact that the logical forms which can be generated from the surface structures of these sentences do not satisfy the well-formedness conditions on logical forms. This situation is a function of the fact that wh-movement moves a wh-phrase, in these cases containing a constituent quantified noun phrase, into COMP position. Notice that this explanation allows us to construct an independent argument for the existence of COMP. Consider the alternative, in which it is assumed that wh-movement is an adjunction operation. Under this assumption, the surface structure (2.51)b is (2.61), rather than (2.55):



In (2.61), as opposed to (2.55), there are two S's to which QR may adjoin the noun phrase 'some city'. While we know that adjunction to S_j will lead to an ill-formed structure, adjunction to S_i does not have the same affect: (2.62) is a well-formed logical form:

$$(2.62) \quad [_S[\text{some city}]_\alpha [_{S_i}[\text{which men in } \alpha]_t [_S[\text{did you meet } t]]]]$$

Here, both of the variables, ' α ' and ' t ', are properly bound: ' α ' is c-commanded by 'some city' and ' t ' is c-commanded by the wh-quantifier.

Assuming that wh-movement is an adjunction, and not a movement into COMP, therefore, leads to an incorrect prediction, i.e., that sentences like (2.51)b are well-formed. This is because (2.62) is a well-formed logical form, consistent with the Condition on Proper Binding.¹³ This is in marked contrast to holding that there is a phrase structure rule $\bar{S} \rightarrow \text{COMP} - S$, which correctly predicts that such sentences are ill-formed.¹⁴ Given this significant empirical difference, the analysis presented above of the properties of sentences like (2.51) - (2.54) and (2.59) provides an independent argument for the existence of the COMP node, into which wh-phrases are moved by wh-movement.

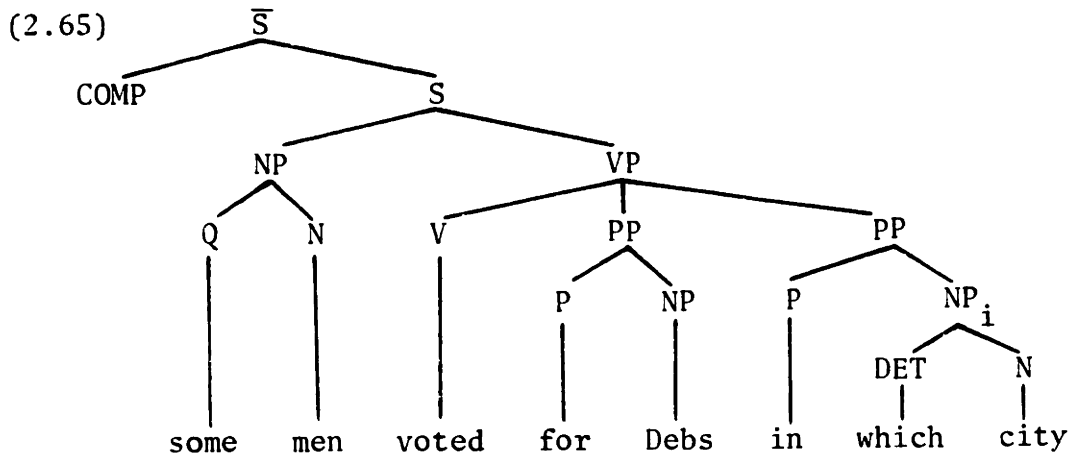
The sorts of wh-constructions which have been considered up to this point have been of essentially two types: those, like (2.49), in which a wh-phrase and a quantifier phrase do not form a constituent in surface structure, and those like (2.51)b - (2.54)b and (2.59), where they do. Besides these constructions, there exist other cases, which are superficially similar to structures of the latter type, but which are, in fact parallel in structure to sentences of the former type. Examples of the constructions I have in mind are (2.63) and (2.64):

$$(2.63) \text{a} \quad [\bar{S}[_{\text{COMP}} \text{In which city}]_t [_S[\text{did some men vote for Debs } t]]]$$

$$\text{b} \quad [\bar{S}[_{\text{COMP}} \text{Which city}]_t [_S[\text{did some men vote for Debs in } t]]]$$

- (2.64)a $[\bar{S}[_{COMP} \text{in which city}]_t [_S \text{did you meet some men } t]]$
 b $[\bar{S}[_{COMP} \text{which city}]_t [_S \text{did you meet some men in } t]]$

The examples in (2.63) are derived from a structure, illustrated in (2.65), in which the wh-phrase does not form a constituent with the noun phrase



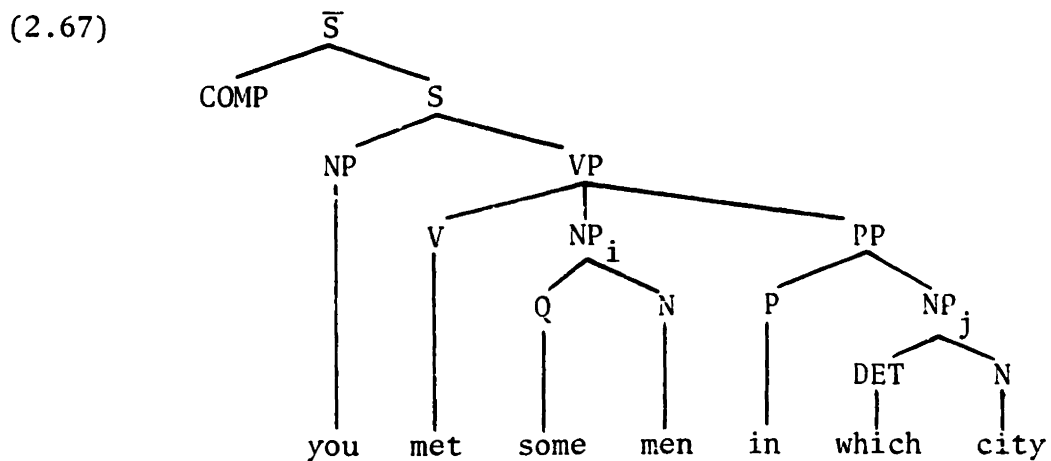
'some men'.¹⁵ (2.63)b is generated by movement of the wh-phrase, NP_i , into COMP. Wh-movement in this structure may also affect the PP immediately dominating NP_i , generating (2.63)a.¹⁶ From either of these surface structures generable from (2.65), it is possible to generate a well-formed logical form, by adjoining the phrase 'some city' to S. Thus, for example, the logical form associated with (2.63)b is (2.66), which satisfies the Condition on Proper Binding:

- (2.66) $[\bar{S}[_{COMP} \text{which city}]_t [_S [\text{some men}]_\alpha [_S \text{did } \alpha \text{ vote for Debs in } t]]]$

The examples in (2.64) should be compared to example (2.59)a, repeated here. Recall that in section 2.3 above it was pointed out that

(2.59)a * $[\bar{S}_{COMP} \text{some people in which city}]_t [\text{S did you meet } t]$

sentences which may take PP-complement constructions as objects, can also be associated with structures in which the noun phrase and the prepositional phrase are non-constituent verbal complements. Thus, while (2.59)a is derived from a structure in which 'some people in which city' is a PP-complement, the sentences in (2.64) are derived from the latter sort of construction, illustrated in (2.67), either by movement of NP_i into COMP, or of the PP which immediately dominates it. The former application



of wh-movement generates (2.64)b, while the latter generates (2.64)a. From both of these surface structures it is possible to generate well-formed logical forms, again by adjoining the quantified noun phrase, 'some men', to S, where it will c-command the variable which it binds. The

logical form associated with (2.64)a is shown in (2.68):

$$(2.68) \quad [\bar{S}[\text{COMP}^{\text{which city}}]_t [\text{S}[\text{some men}]_\alpha [\text{S}[\text{you met } \alpha \text{ in } t]]]]$$

In (2.68), as in (2.66), both of the variables, ' α ' and ' t ' are properly bound. This structure, therefore, satisfies the Condition on Proper Binding, and is, hence, well-formed.

From a structure such as that in (2.67) it is possible to generate another direct question, (2.69), where the wh-phrase is NP_i rather than

$$(2.69) \quad [\bar{S}[\text{COMP}^{\text{which men}}]_t [\text{S}[\text{did you meet } t \text{ in every city}]]]$$

NP_j . As in the other examples, a well-formed logical form can be generated from this surface structure, by adjoining 'every city' to S. This gives (2.70):

$$(2.70) \quad [\bar{S}[\text{COMP}^{\text{which men}}]_t [\text{S}[\text{every city}]_\beta [\text{S}[\text{did you meet } t \text{ in } \beta]]]]$$

In the examination of sentences containing both wh-phrases and quantified noun phrases, we have seen, then, that when a quantified phrase is contained in COMP in surface structure, it is not possible to generate a well-formed logical form for that sentence. This is because in the generation of these structures, QR performs a rightward movement, resulting in a structure in which a variable is not properly bound. On the other hand, if in surface structure, the quantified phrase is not a constituent

of COMP, then it is possible to generate a well-formed logical form. Here, QR performs a leftward movement, thus creating a structure in which all of the variables are properly bound. The distribution of the wh-constructions just discussed, therefore, is a result of the general conditions bounding downward movements; in this case, rightward movement of a noun phrase by QR.

This concludes our discussion of the interrelationships of wh-movement and QR. We have seen (i) that it follows as a consequence of this theory that wh-quantifiers always have maximally wide scope; (ii), that a number of gaps in the distribution of wh-constructions, which are otherwise inexplicable on the usual assumptions concerning wh-movement, are explained by the fact that their logical forms do not satisfy the Condition on Proper Binding, and (iii), that this analysis of the gaps in wh-constructions leads to an indirect argument for the existence of a COMP node, into which wh-phrases are moved.

2.5 The marked cases. Up to this point, we have been considering the unmarked interpretation of PP-complement constructions, in which they are associated with logical forms which are inversely linked. This interpretation is a general property of these constructions, and its existence can be determined as function of the surface structure of sentences containing this construction, independently of the semantic contribution of the lexical items in a given sentence of this type. As we saw in section 2.2, an inversely linked logical form is the only logical form which can be assigned to PP-complement constructions by the

rules of sentence grammar. There do exist sentences, though, which contain such constructions, but which are not unambiguous; not only do they have an inversely linked reading, but also a reading in which the embedded quantifier has narrower scope than the head quantifier. Some examples of sentences displaying this ambiguity are illustrated in (2.71):¹⁷

- (2.71)a Every senator on a key congressional committee voted for the amendment
- b Some benefactor of every worthy cause is a happy man
- c The head of every public authority in New York is a powerful public figure
- d Every patient with every non-contagious disease will be released from care
- e Every house near a large nuclear reactor was contaminated after meltdown

In each of these cases, the latter interpretation is essentially parallel to that of a relative clause; the examples in (2.71) can be paraphrased as in (2.72):

- (2.72)a Every senator who is on a key congressional committee voted for the amendment
- b Some person who is a benefactor of every worthy cause is a happy man
- c The person who is head of every public authority in New York is a powerful public figure
- d Every patient who has every non-contagious disease will be released from care
- e Every house which is near a large nuclear reactor was contaminated after meltdown

Given this parallelism between this reading of (2.71) and the paraphrases in (2.72), we will refer to this interpretation as the relative, as opposed to the inversely linked, interpretation.

The relative interpretation of sentences like (2.71) is, as compared to their unmarked, inversely linked reading, highly irregular and idiosyncratic. For instance, the existence of this interpretation is dependent, in part, upon the particular preposition contained in the PP-complement. For example, cases like those in (2.73), in which the preposition is 'in' are all unambiguous; they only have an inversely linked

- (2.73)a Everybody in an Italian city met John
- b Some toys in every store are defective
- c Every family in every town south of L.A. faces
 the threat of brush-fire

reading. The existence of the relative interpretation is also dependent upon the particular quantifiers contained in the PP-complement. A striking example comes from comparing (2.71)a, (repeated here as (2.74)a, which is ambiguous between an inversely linked and relative reading, to

- (2.74)a Every senator on a key congressional committee voted
 for the amendment
- b Each (of the) senator(s) on a key congressional committee
 voted for the amendment
- c All of the senators on a key congressional committee
 voted for the amendment

(2.74)b and (2.74)c. The two latter sentences are unambiguous, having

only an inversely linked interpretation. A similar situation also holds in cases where the embedded quantifier is varied. Compare (2.75)a and (2.75)b:

- (2.75)a Every house near a large nuclear reactor was contaminated after meltdown
- b Every house near some large nuclear reactor was contaminated after meltdown

Here (2.75)a is ambiguous, while (2.75)b is unambiguous, the latter only having an inversely linked interpretation.

The occurrence of the relative interpretation for PP-complement constructions is governed not only by factors brought to bear by the particular lexical items contained in a sentence, but also by the depth of embedding of prepositional phrases. Compare sentence (2.76), which is ambiguous, to those in (2.77), which contain greater levels of

(2.76) Every exit from a freeway is badly constructed

- (2.77)a Every exit from a freeway to some California city is badly constructed
- b Every exit from a freeway to some California city in every county south of L.A. is badly constructed

embedding of prepositional phrases. Neither of these sentences has a relative interpretation, as does (2.76); rather, they are unambiguous, having only an inversely linked reading. Thus, it seems that while the

existence of the relative interpretation is dependent on the depth of embedding, the inversely linked interpretation is always possible, regardless of the depth of embedding of prepositional phrases containing quantifiers.

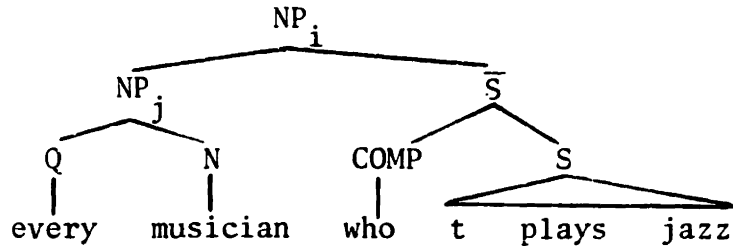
What these observations indicate is that while PP-complement constructions may always have an inversely linked interpretation, they can only sometimes have a relative interpretation, and then only under highly marked circumstances. Under the general approach to linguistic markedness we are pursuing here, this is exactly the result we would expect, since an inversely linked logical form is the only one generable, by the rules of sentence grammar, from the surface structure of PP-complement constructions. A logical form in which the embedded quantifier takes narrow, rather than wide scope cannot be generated by these rules.¹⁸ Thus, this theory predicts that the inversely linked interpretation should hold universally in this construction. Within sentence grammar, then, an explanation can be provided for the nature of the unmarked case; an account of the marked, relative interpretation, though, lies beyond the expressive power of sentence grammar. This is not surprising, since the existence of this interpretation is predicated upon factors, such as the nature of the particular prepositions and quantifiers, and the depth of embedding of prepositional phrases, which are beyond the scope of sentence grammar. We return to the status of the marked cases of PP-complement constructions in Chapter Four.

2.6 Relative Clause Constructions. Restrictive relative clauses suffer,

in certain respects, from linguistic schizophrenia. Since they are noun phrase modifiers, they share many features in common with other nominal constructions, such as the PP-complement constructions just discussed. They differ from PP-complements, though, in that the complement to the head noun is a sentence, rather than a prepositional phrase. Thus, they also have properties in common with sentential matrix-complement constructions. Because of this split personality, we will divide our discussion of relative clauses into two parts. In this chapter, the discussion will center on those aspects of relative clause constructions which they share with other nominal constructions. In Chapter Three, we will turn our attention to their sentential side.

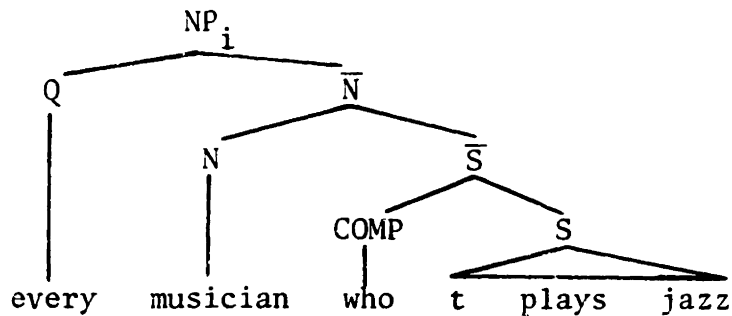
In Section 2.2, it was shown that the particular assumptions one makes as to the internal structure of PP-complements is not a relevant parameter in determining the range of possible interpretations of noun phrases containing such complements, since the identical logical form is generable from each of the possibilities. Thus, as far as quantification is concerned, for this construction matters of form are independent of matters of interpretation. This result is mirrored by a parallel situation in restrictive relative clauses. Thus, just as three different surface structures have been suggested for PP-complements, three parallel structures have also been suggested for restrictive relatives. The difference between them is that relative constructions have an \bar{S} node in place of the PP node in their PP-complement counterparts. Thus, parallel to (2.10), many authors (e.g., Ross (1967); Vergnaud (1974); Andrews (1975) and Emonds (1976)) have argued in favor of the structure (2.78), where the initial quantifier and head noun form a noun phrase constituent.

(2.78)



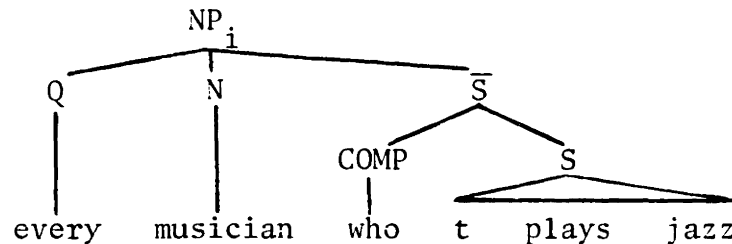
In the other two structures which have been suggested, these two elements do not form a single noun phrase constituent. In (2.79), which is structurally parallel to (2.11), the head noun forms an \bar{N} constituent

(2.79)



with the clause. This structure has been advocated by Dean (1967), Partee (1975) and Jackendoff (1976), among others. The third structure is where, in surface structure, the initial quantifier, head noun and the clause are independent, as in (2.80), the relative counterpart of (2.12):

(2.80)



This structure, proposed by Smith (1964) and Selkirk (1970), is derived from a deep structure in which the relative clause is a constituent of the specifier element, by a relative clause extraposition rule.

The significant point here is that, just as in the case of PP-complement constructions, the same logical form is associated with each of these structures. In each of them, by virtue of the Condition on Analyzability, QR affects NP_i , adjoining that noun phrase to the S of which it is a constituent, since in each case this is the maximal NP immediately dominating Q. Thus, QR generates for sentence (2.81) the logical form (2.82), which is ultimately associated with a converted form along the lines of (2.83), (on the assumption that wh functions as a

(2.81) Every musician who plays jazz likes Ellington

(2.82) $[_S[\text{every musician who } t \text{ plays jazz}]_\alpha [_S^\alpha \text{ likes Ellington}]]$

conjunction in relative clause constructions):

(2.83) $[_C \forall \alpha [_S [_S^\alpha \text{ is a musician \& } \alpha \text{ plays jazz}] \rightarrow [_S^\alpha \text{ likes Ellington}]]]$

Thus, as for the quantification in concerned, the question of the syntactic constituency of relative clauses is independent of the question of their interpretation, since the same logical form, and hence interpretation, is associated with all three of the possible relative clause structures.

It is a consequence of this result that any argument for or against these structures, which is based on the semantic properties of the head

quantifier, is moot. Recently, though, an argument of this type has been presented in Partee (1975), who argues in favor of an \bar{N} type structure, as in (2.79). She holds that:

If the syntactic and semantic rules are to correspond in compositional structure, which is a fundamental assumption in Montague's approach, then relative clauses must also be syntactically combined with common noun phrases, and the definite article [quantifier - RCM] attached to the result.

(p. 231)

Thus, she claims that in the interpretation of 'the man who dates Mary', there is "the proposition that one and only one object has the property designated by the common noun phrase to which the is attached." (p. 230-1). It has been argued, by Chomsky (1975b), that this analysis apparently cannot be extended to the analysis of plural definite descriptions. This is because in examples like 'the books which we ordered arrived', "taking the complex class-denoting phrase to denote the intersection of the two classes denoted by "books" and "we order x," then applying the principle that "one and only one object has the property designated by "this common noun phrase,...will give us the same interpretation as derived for 'the book we ordered", an incorrect conclusion." (p. 98). This argument is telling upon the notion that there exists a compositional isomorphism between syntactic and semantic rules, since the meaning of 'the', (viz., "one and only one object...") is not part of the meaning of the noun phrase which results from combining 'the' with a plural common noun phrase. Thus, given this argument, there are seemingly problems of descriptive adequacy

which undermines Partee's contention that there is a one-one relation between syntactic and semantic rules.

While Partee's argument is limited in this respect, it does raise an interesting methodological point. The significance of her argument lies in the assumption "that the syntactic rules which determine how a sentence is built up out of smaller syntactic parts should correspond one-to-one with the semantic rules that tell how the meanings of a sentence is a function of its parts." (p. 203). It should be recognized, though, that this assumption is not a necessary condition for an adequate theory of natural language semantics. Indeed, given the empirical adequacy of the theory being developed here, which does not satisfy this condition, it does not appear to be necessary to assume that there is a one-to-one relationship between those rules constructing syntactic forms, and those constructing logical forms. But, even if such a relationship could be established in this theory, it would not necessarily support one analysis of relative clause structure over another, since, as we have seen, the semantic issue, (i.e., the interpretation of quantification in relative clause constructions) is independent of the issue of the syntactic structure of relative clauses. Thus, regardless of how this latter issue is resolved, it will not be possible to invoke quantificational phenomena as evidence for the proper analysis of the structure of relative clauses.

2.7 Possessives and Nominalizations. To begin, consider the interpretation of sentences like (2.84), which contain a quantified possessive

phrase:

(2.84) Every scholar's book is selling well this year

The interpretation of (2.84) differs from that of the parallel sentence (2.85), in that in the former case, the quantifier 'every' ranges over

(2.85) Every scholarly book is selling well this year

the set of scholars, while in (2.85) the domain of 'every' is the set of scholarly books. This distinction is highlighted by comparing the direct questions in (2.86):

- (2.86)a Which scholar's book is selling well this year?
- b Which scholarly book is selling well this year?

Notice that an appropriate answer to (2.86)a is the name of a scholar, but that the name of a book is not. This latter reply is appropriate to (2.86)b. Thus, if asked (2.86)a, I could appropriately reply "Prof. Halle's", but not "The Sound Pattern of Russian". This latter reply, though, would be a perfectly natural answer to (2.86)b.¹⁹

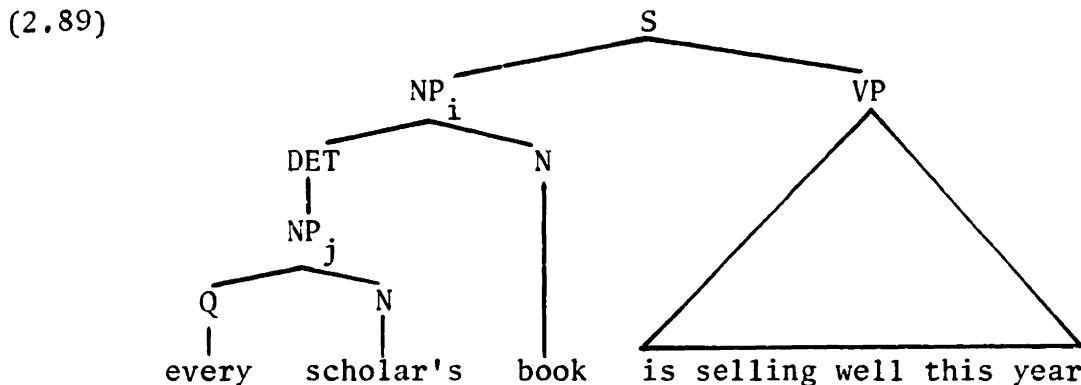
What this shows is that the logical forms which are associated with sentences containing possessive noun phrases, such as (2.84), differ from the logical form (2.87), which is associated with (2.85). In (2.87) the entire phrase 'every scholarly book' is construed as the quantifier phrase. The contrasting properties of possessive structures,

(2.87) $[_S[\text{every scholarly book}]_{\alpha} [_S\alpha \text{ is selling well this year}]]$

on the other hand, follows if the possessive NP, 'every scholar' is construed as the quantified phrase, i.e., as having the logical form (2.88):

(2.88) $[_S[\text{every scholar}]_{\alpha} [_S\alpha\text{'s book is selling well this year}]]$

This property of possessive noun phrase structures follows as a consequence of the functioning of QR, constrained by the Condition on Analyzability. Thus, it has long been assumed, for example by Lees (1963), and more recently, by Chomsky (1970) and Siegel (1974), that possessive noun phrases are generated as constituents of the noun phrase determiner. The structure of (2.84), then, is essentially (2.89):²⁰



Possessive noun phrases, with the structure in (2.89), differ from the PP-complement structures we have been considering, in that they contain a quantified noun phrase embedded in the specifier of a noun, rather than in a complement to a noun. What these constructions have in common, though, is that

in each of them there is a non-nominal phrasal node intervening between a quantified noun phrase and the NP in which it is embedded. Thus, in the case of PP-complement constructions, there is a PP intervening, and in possessives there is a DET intervening. The Condition on Analyzability specifies that QR apply to the minimal NP dominating a Q, which is not immediately dominated by another NP (or AP). In (2.89), this is NP_j , which is immediately dominated by DET, and not by NP_i . QR applying in this manner will then generate (2.88), by adjoining NP_j (= 'every scholar') to S.²¹

This explanation of the type of logical form associated with possessive NP's containing quantifiers can be extended to an explanation of the properties of quantifiers in a broader class of nominalizations, whose "subjects" are dominated by DET. In particular, consider the nominalization in (2.90) and (2.91), which are adapted from examples in Chomsky (1970):

(2.90) Every city's destruction by some pestilence was
assured by their misdeeds

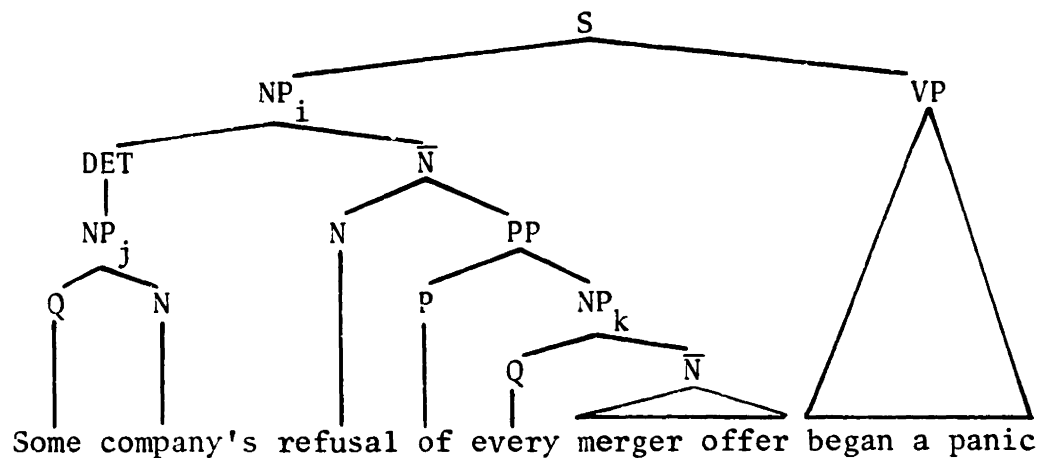
(2.91) Some company's refusal of every merger offer began a
panic.

Both of these sentences are ambiguous. For example, (2.90) may be logically paraphrased as 'There is a pestilence, such that for each city, its destruction by that pestilence was assured by their misdeeds', or as 'For each city, there is some pestilence, such that the city's destruction by the pestilence was assured by their misdeeds'. Similarly, (2.91) may be paraphrased as 'For each merger offer,

there is some company (or other), such that their refusal of it began a panic of the floor of the exchange', or by 'There is a company, such that for each merger offer, their refusal of it began a panic on the floor of the exchange'. In each of these sentences, then, the ambiguity characterized by these paraphrases is an ambiguity of scope. In the former paraphrases, the embedded quantifier is construed as taking wider scope, while in the latter paraphrases it is construed as having narrower scope, vis-a-vis the quantifier embedded in the possessive structure.

This ambiguity is in marked contrast to PP-complement constructions, which are normally unambiguous; cf. section 2.2. Its existence follows immediately, once we consider the surface structure of (2.91):

(2.92)



We are employing (2.91) as an illustrative example, but the comments which follow hold equally well of (2.90). In this structure, QR may apply both to NP_j and NP_k . Both of these noun phrases are minimal noun phrases dominating a quantifier, 'some' in the case of NP_j and 'every' in the case of NP_k . In neither case is the noun phrase immediately dominated

by another NP; NP_j is immediately dominated by DET, and NP_k by PP. This circumstance allows for the generation of two distinct logical forms from (2.92):

$$(2.93) \quad [{}_S[\text{every merger offer}]_{\beta} [{}_S[\text{some company}]_{\alpha} \\ [{}_S\alpha\text{'s refusal of } \beta \text{ began a panic}]]]$$

$$(2.94) \quad [{}_S[\text{some company}]_{\alpha} [{}_S[\text{every merger offer}]_{\beta} \\ [{}_S\alpha\text{'s refusal of } \beta \text{ began a panic}]]]$$

Notice, that in contrast to the PP-complement and relative clause constructions discussed above, the surface structure (2.92) is associated with non-linked, rather than linked, logical forms. Since these two non-linked logical forms are the only logical forms generable from the surface structure (2.92), it follows that sentences containing multiply quantified nominalizations should be ambiguous.²²

What these brief comments indicate is that the range of logical forms which can be associated with sentences containing quantified nominalizations and possessive noun phrases follows from the functioning of QR to their surface structures, as constrained by the Condition on Analyzability. Thus, the range of quantificational phenomena in sentences containing complex noun phrases which is explained by the theory being proposed here can be expanded to included possessives and nominalizations.

2.8 Partitive Constructions. Selkirk (1977) has noted a very curious

phenomenon in partitive constructions. She points out that the range of elements which may occupy the embedded noun phrase specifier position in this construction is highly restricted. Thus, as the examples in (2.95) show, this position may be occupied by a possessive proper name, a

- (2.95) a Each of John's friends
 b Some of his flowers
 c All of these proofs
 d Many of the objections

possessive pronoun, a demonstrative pronoun, or the definite determiner, but not, as the examples in (2.96) show, by a quantifier:

- (2.96) a *Each of some friends
 b *Some of every flower(s)
 c *All of many proofs
 d *Many of several objections
 e *One of each collection

In order to account for this distribution, Selkirk suggests the following constraint:

Partitive Recursion Constraint

Rule out as ungrammatical any partitive construction containing some, all, no, Δ (=indef), and so on, in the lower noun phrase

What we wish to show in this section is that the fact captured by Selkirk's constraint is a sub-case of a more general well-formedness condition on

logical forms associated with sentences containing partitive noun phrases, to the effect that names may not occupy the object position of 'of' in this construction.

Consider first the generation of the logical forms associated with a sentence containing one of the partitives in (2.95):

(2.97) $[_S[_{NP}[_Q \text{each}] \text{ of } [_{NP} \text{John's friends}]] \text{ likes jazz}]$

(We are assuming that (2.97) minimally represents the structure which would have to be represented in any adequate analysis of partitive constructions.) In (2.97), which contains only a single quantifier, QR affects the noun phrase 'each of John's friends', generating the logical form (2.98):

(2.98) $[_S[\text{each of John's friends}]_{\alpha} [_S^{\alpha} \text{ likes jazz}]]$

(2.98) is a well-formed logical form, since it satisfies both the Condition on Proper Binding and the Condition on Quantifier Binding.

(2.98) represents the interpretation characteristically associated with partitive constructions, in which the quantifier is interpreted as ranging over the members of the set denoted by the embedded noun phrase, in this case, the set of John's friends.

Sentences containing phrases such as those in (2.96) differ from those containing one of the phrases in (2.95), in that the former contain two quantifiers. For example, consider (2.99):

(2.99) $*[{}_S[{}_{NP}{}_Q \text{each}] \text{ of } [{}_{NP}{}_Q \text{some}] \text{ friends}]] \text{ likes jazz}]$

From the surface structure (2.99), there are two structures which may be generated by QR: (2.100) and (2.101):

(2.100) $[{}_S[\text{each of } \beta]_\alpha [{}_S[\text{some friends}]_\beta [{}_S^\alpha \text{ likes jazz}]]]$

(2.101) $[{}_S[\text{some friends}]_\beta [{}_S[\text{each of } \beta]_\alpha [{}_S^\alpha \text{ likes jazz}]]]$

A derivation of (2.100) is illustrated in (2.102); one of (2.101) in (2.103):

(2.102) $[{}_S{}_i[{}_{NP}{}_Q \text{each}] \text{ of } [{}_{NP}{}_Q \text{some}] \text{ friends}]] \text{ likes jazz}] \rightarrow$
 $[{}_S[\text{each of } [{}_{NP}{}_Q \text{some}] \text{ friends}]]_\alpha [{}_S{}_i^\alpha \text{ likes jazz}]] \rightarrow$
 $[{}_S[\text{each of } \beta]_\alpha [{}_S[\text{some friends}]_\beta [{}_S{}_i^\alpha \text{ likes jazz}]]]$

(2.103) $[{}_S{}_i[{}_{NP}{}_Q \text{each}] \text{ of } [{}_{NP}{}_Q \text{some}] \text{ friends}]] \text{ likes jazz}] \rightarrow$
 $[{}_S[\text{some friends}]_\beta [{}_S{}_i[{}_{NP}{}_Q \text{each}] \text{ of } \beta] \text{ likes jazz}]] \rightarrow$
 $[{}_S[\text{some friends}]_\beta [{}_S[\text{each of } \beta]_\alpha [{}_S{}_i^\alpha \text{ likes jazz}]]]$

Of these two logical forms, (2.100) is clearly ill-formed. It does not satisfy the Condition on Proper Binding, since the variable ' β ' is not c-commanded by 'some friends', the quantified phrase which binds it.

(2.101), on the other hand, does satisfy this condition: the 'some'-phrase c-commands ' β ' and the 'each'-phrase c-commands ' α '. There are independent reasons, however, for why (2.101) is not a well-formed logical form.

Notice that quantified phrases are not the only noun phrases which are barred from the embedded position in partitives; so are proper names. Thus, (2.104) is as ill-formed as (2.99):

(2.104) *Each of John likes jazz

In order to rule out (2.104), let us suppose the following condition on well-formed structures at Logical Form:

(2.105) *...Q (of) NP..., where NP is a name.

(2.105) accounts for the deviance of (2.104), because the logical form associated with this sentence, which is (2.106), contains the phrase 'each of John':

(2.106) * $[_S[\text{each of John}]_\alpha [_S^\alpha \text{likes jazz}]]$

It also accounts for the deviance of (2.101), since if a proper name cannot occupy the inner position of a partitive, then it follows that neither can a variable, which is a special case of a name. (2.101) is ill-formed, therefore, since it contains the phrase 'each of β ', in violation of (2.105). The reason for the deviance of (2.99), then, is that it is not possible to associate it with a well-formed representation at the level of Logical Form; both (2.100) and (2.101), the structures which can be derived by QR from (2.109), violate conditions on well-formed logical

forms.

While the ultimate motivation for the condition (2.105) resides in the mode of interpretation of partitive quantifiers,²³ what is of interest to us is that it is only if we assume that there is a level of linguistic representation at which quantifiers bind variables, i.e., Logical Form, is it possible to state a uniform constraint which accounts for the types of noun phrases which may appear in the internal position in partitives.

Notice that this account of the range of possible partitive constructions holds generally, regardless of the exact nature of the internal structure of partitives; i.e., the range of possible interpretable partitives is not dependent, in this regard, on any particular theory as to their structure.²⁴ Furthermore, it obviates the necessity of stipulating what can be the internal noun phrase specifier in this construction. Given the analysis being proposed here, we may simply assume that this noun phrase is like any other noun phrase in English, and thus its specifier may be freely generated as DET or Q, (or it may be null). It is only in the case where the specifier is DET that it will be possible to generate a well-formed logical form. Thus, it follows from the Condition on Proper Binding, and the filter condition (2.105), that the internal noun phrase in partitives is "immune" to quantification.

This explanation extends naturally to sentences which contain more complex partitive constructions. For example, consider the sentences in (2.107) and (2.108).

(2.107) $*[{}_S[{}_{NP}{}_Q\text{many}] \text{ of } [{}_{NP}{}_Q\text{each}] \text{ of } [{}_{NP}{}_{DET}\text{the}] \text{ wards}]]]$
 voted for Debs]

(2.108) $[{}_S[{}_{NP}{}_Q\text{many}] \text{ of } [{}_{NP}[]_{NP}{}_{DET}\text{the}] \text{ voters}] [{}_{PP}\text{in } [{}_{NP}{}_Q\text{each}]$
 ward]]]] cast their ballots for Debs]

The noun phrases in both (2.107) and (2.108) are base generable; the NP in (2.107) is a partitive generated within a partitive, in (2.108) a PP-complement structure is embedded within a partitive. (2.107) is ill-formed for the same reason as is a sentence like (2.99) which contains a simple partitive; both of the logical forms which may be associated with it are ill-formed. (2.109)a violates the Condition on Proper Binding, while (2.109)b contains an ill-formed quantifier phrase, violating condition (2.105).

(2.109)a $*[{}_S[\text{many of } \beta]_{\alpha} [{}_S[\text{each of the wards}]_{\beta} [{}_S\alpha \text{ voted for}$
 Debs]]]

b $*[{}_S[\text{each of the wards}]_{\beta} [{}_S[\text{many of } \beta]_{\alpha} [{}_S\alpha \text{ voted for}$
 Debs]]]

From the surface structure (2.108), on the other hand, it is possible to generate a well-formed logical form, (2.110):

(2.110) $[{}_S[\text{each ward}]_{\beta} [{}_S[\text{many of the voters in } \beta]_{\alpha}$
 $[{}_S\alpha \text{ cast their ballots for Debs}]]]$

This structure satisfies the Condition on Proper Binding, and does not contain any ill-formed quantified phrases, as does (2.109)b: 'many of the voters in β ' is well-formed, just as the quantifier phrase 'many voters in β ' in (2.111) is:

$$(2.111) \quad [_S[\text{each ward}]_\beta \quad [_S[\text{many voters in } \beta]_\alpha \\ [_S^\alpha \text{ cast their ballots for Debs}]]]$$

(2.108) then, as opposed to (2.107), is well-formed because it is possible to associate it with a well-formed logical form, (which is not possible for (2.107)).²⁵

In section 2.4, a number of gaps in the distribution of wh-constructions with PP-complements were discussed. These gaps are mirrored by parallel gaps in wh-sentences containing partitives. For example, just as a quantifier could not occur as the specifier of the embedded NP in a PP-complement with a wh head, it is also not possible for a quantifier to occupy this position in a parallel partitive construction:

$$(2.112)a \quad [_S[_{COMP}^{\text{which of John's friends}}]_t \quad [_S \text{did Harry see } t]] \\ b \quad *[_S[_{COMP}^{\text{which of all friends}}]_t \quad [_S \text{did Harry see } t]]$$

(2.112)b is ill-formed for the same reason as its PP-complement counterpart; it is not possible to associate it with a well-formed logical form. Thus, QR applying to the surface structure (2.112)b would generate

(2.113), by adjoining the NP 'all friends' to S:

(2.113) $*[\bar{S}_{COMP}^{which\ of\ \alpha}]_t [S[all\ friends]_{\alpha} [S\ did\ Harry\ see\ t]]]$

(2.113) violates the Condition on Proper Binding, since the variable ' α ' is not c-commanded by the quantifier which binds it. In (2.112)a, on the other hand, the only quantifier in the sentence, i.e., wh, properly binds the variable 't', thus satisfying the Condition on Proper Binding.

Another parallelism to wh-headed PP-complements is the ill-formedness of sentences like those in (2.114) and (2.115)

(2.114) $*[\bar{S}_{COMP}^{many\ of\ whom}]_t [S\ did\ John\ see\ t]]]$

(2.115) $*[\bar{S}_{COMP}^{many\ of\ whom}]_t [S^t\ voted\ for\ Debs]]]$

Here, it is not possible to associate these surface structures with logical forms which satisfy the Condition on Quantifier Binding. In each of them, QR will function to adjoin the 'many' phrases to S, generating the structures in (2.116):²⁶

(2.116)a $*[\bar{S}_{COMP}^{\alpha}]_t [S^{many\ of\ whom}_{\alpha} [S\ did\ John\ see\ t]]]$

b $*[\bar{S}_{COMP}^{\alpha}]_t [S^{many\ of\ whom}_{\alpha} [S^t\ voted\ for\ Debs]]]$

Both of these structures are ill-formed, since they contain a quantified phrase, 'many of whom' which does not properly bind a variable. Notice

that they do not violate the Condition on Proper Binding, only the Condition on Quantifier Binding. This is because COMP is not an argument position.

As in the case of PP-complement constructions, all of the ill-formed cases, (2.112)b, (2.114) and (2.115) are generable, as far as wh-movement is concerned. Their deviance does not follow from some property of this rule. Rather, it is a function of the Conditions on Proper Binding and Quantifier Binding, which are not satisfied by the structures derived by QR when it applies to surface structures in which quantified phrases are constituents of COMP.

In this chapter, we have seen that the same set of principles which explained the range of possible interpretations of single clause sentences containing simple noun phrases readily generalizes to provide an explanation of the possible interpretations of sentences containing complex nominal constructions. In particular, we have seen that it follows, from the functioning of QR, and the Conditions on Analyzability, Proper Binding and Quantifier Binding, that PP-complement constructions are characteristically associated with inversely linked logical forms, a situation which holds regardless of particular assumptions about their structure. It has also been seen that these principles afford an explanation for differences in interpretation in NP-PP sequences occurring post-verbally as opposed to pre-verbally, as well as for a range of properties of wh-constructions. Furthermore, we have seen that just as in the case of PP-complement constructions, the question of relative clause structure is independent of the question of their interpretation, as

far as quantification is concerned.

Finally, we have seen that it is possible to explain, on the basis of our general grammatical assumptions, the nature of the logical forms which are associated with sentences containing quantified possessive noun phrases, nominalizations and partitives, extending the explanation which was developed for PP-complement constructions to a wider range of nominal constructions.

Appendix: ON THE NON-EXTENDABILITY OF THE A/A CONDITION

In formulating the Condition on Analyzability, repeated here as (A1), a clause which insures that rules like QR or wh-movement affect the

(A1) Condition on Analyzability

If a rule ϕ mentions SPEC, then ϕ applies to the minimal $[+N]$ -phrase dominating SPEC, which is not immediately dominated by another $[+N]$ -phrase

higher phrase, in a situation where a $[+N]$ -phrase (dominating a specifier element) is immediately dominated by another $[+N]$ -phrase, is included.

In this chapter, it has been shown how this clause of the Condition on Analyzability insures a general explanation of the properties of quantification in PP-Complement and Relative Clause constructions, independently of assumptions about their internal structure. Thus, a central part of the significance of the notion of immediate domination is that it is extendable to explaining not only syntactic phenomena, (see Ross (1974), Sag (1976), Woisetschlaeger (1976)), but also to a wide range of semantic phenomena. Indeed, the generality of this notion provides strong empirical confirmation for the Condition on Analyzability.

It has been held by many linguists that the empirical effects of the immediate domination clause of the Condition on Analyzability is a function of the A-over-A (A/A) Condition. This condition was first proposed in Chomsky (1962), and has received further attention in Chomsky (1968), (1973), Ross (1967), Kayne (1975), Bresnan (1976a), Sag (1976)

and Woiwetschlaeger (1976), among others. It has been utilized, for example, to explain the impossibility of extraction from PP-complements (*'Which city did some men in vote for Debs'), left branches of NP's and AP's (*'Which men did in every city vote for Debs', *'How is Belli good a lawyer') and coordinate structures (*'What did Bill eat ham and'), among other phenomena.²⁷ In this appendix, what we wish to show is that the A/A Condition, in contrast to the Condition on Analyzability, cannot be extended to provide an explanation of the semantic phenomena, which follow (in part) as a consequence of the Condition on Analyzability.

The A/A Condition is usually conceived of as a general convention limiting the range of possible analyses satisfying the structural description of a transformational rule, under which the structural change of that rule may be effected. As an example, consider the formulation of the A/A Condition proposed in Chomsky (1973):

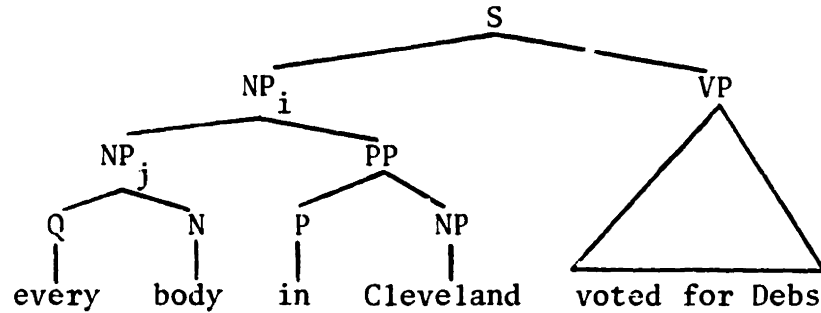
- (A2) If a transformation applies to a structure of the form

$$[\alpha \dots [A \dots] \dots]$$

where α is a cyclic node, then it must be so interpreted as to apply to the maximal phrase of type A.

The effect of this condition is to insure that if a phrase of type A is embedded within another phrase of type A, a rule affecting an A-phrase must affect the maximal (higher) A-phrase. Thus, consider the functioning of QR, in a PP-complement structure like (A3):

(A3)

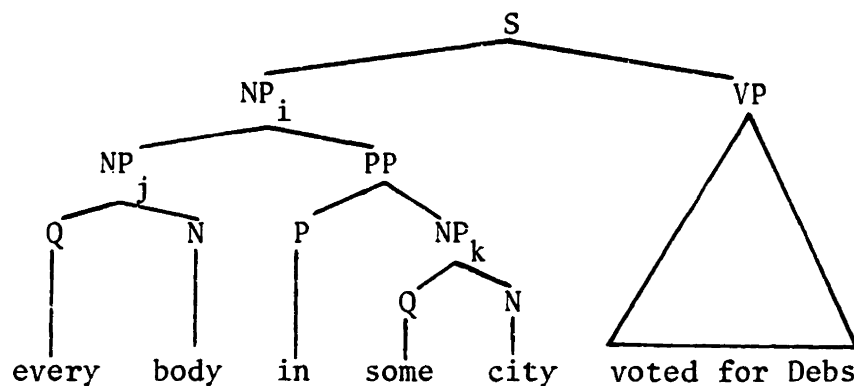


In this structure, QR applies, by the A/A Condition, to NP_i , since it is maximal with respect to NP_j , generating the logical form (A4):

(A4) $[_S[\text{everybody in Cleveland}]_\alpha [_S^\alpha \text{voted for Debs}]]$

The Condition on Analyzability has the same effect on the functioning of QR, since it mandates that QR affects NP_i , which immediately dominates NP_j . In this respect, then, these two conditions are equivalent. A difference shows up though, when we consider PP-complements containing two quantifiers, rather than one:

(A5)

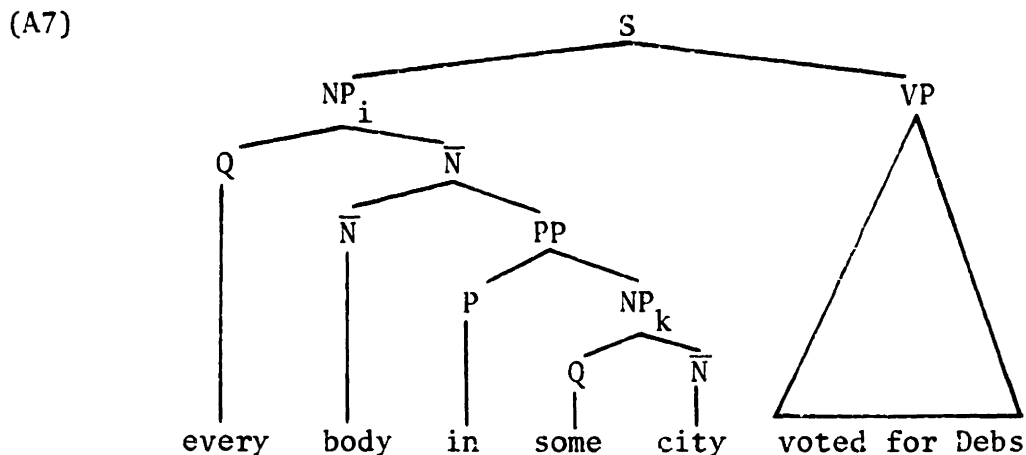


The problem here concerns the application of QR to NP_k . By the A/A Condition, it appears that QR may not apply to this noun phrase, since

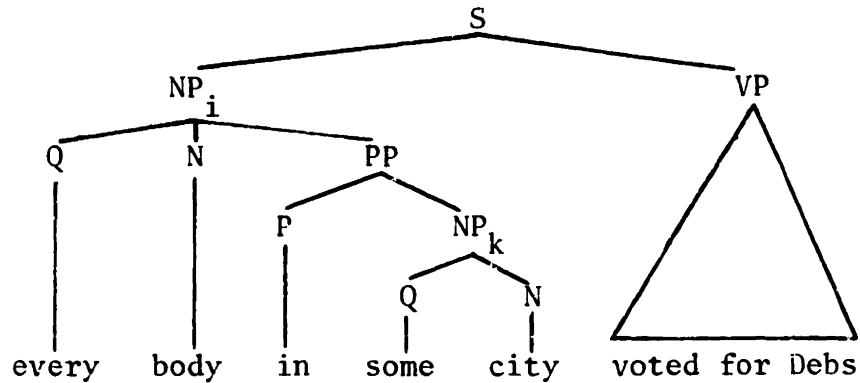
it only permits rules to affect the maximal quantified noun phrase in structures like (A5). The noun phrase which meets this description is NP_i , since it contains, as constituents, both NP_j and NP_k . But, if QR is prohibited from applying to NP_k in (A5), then it is not possible to generate a well-formed logical form from this structure. This is because the structure generated, (A6), does not satisfy the Condition

(A6) $[_S[\text{everybody in some city}]_\alpha [_S \alpha \text{ voted for Debs}]]$

on Quantifier Binding, since it contains a quantifier, 'some', which does not properly bind a variable. This problem is not peculiar to the structure in (A5). It is equally endemic to the alternatives, (A7) and (A8):



(A8)



In both of these cases, NP_i is maximal with respect to NP_k , and, hence, QR may not affect this latter noun phrases in either of these structures. Therefore, the A/A Condition predicts that it is not possible to generate a well-formed logical form for PP-complement constructions. This is clearly a false prediction, since it if were true, all PP-complement constructions containing more than a single, (head), quantifier should be ill-formed.

This result is in marked contrast to the Condition on Analyzability. Since, in each of these structures, NP_k is not immediately dominated by another NP, but rather by a PP, it may be affected by QR. And, as we have seen, QR applying to this noun phrase, as well as to NP_i , generates an inversely linked logical form, as in (A9), from any of these structures:

$$(A9) \quad [{}_S[\text{some city}]_{\beta} [{}_S[\text{everybody in } \beta]_{\alpha} [{}_S^{\alpha} \text{voted for Debs}]]]$$

There exists, then, a clear empirical distinction between the A/A Condition and the Condition on Analyzability. Under the former condition, it is predicted that PP-complements with more than a single head quantifier

are ungrammatical, while under the latter it is predicted that they are well-formed, and, furthermore, that they are associated with inversely linked logical forms.²⁸

The formulation of the A/A Condition in (A2) is a relative formulation, mandating that a rule affecting A-phrases apply to the maximal phrase of type A. This interpretation may be contrasted to an absolute interpretation, which has been principally employed by Kayne (1975). Under this interpretation, the A/A Condition "...absolutely prohibit(s) the extraction by a transformation of category A from within a larger phrase of category A." The difference between these two formulations is that in the former, it is relativized to rules which affect A-phrases, in the latter, it holds absolutely for rules which affect any type of phrases. This interpretation, though, leads to the same results as the relative interpretation in the relevant cases. It explicitly prohibits any rule from affecting NP_k in (A5), (A7) or (A8), since in each case NP_k is contained in a more inclusive noun phrase, NP_i . Thus, regardless of whether the A/A Condition is interpreted relatively or absolutely, it still incorrectly predicts that PP-complement structures with more than a single quantifier are ill-formed. This version of the A/A Condition, therefore, does not extend from rules mapping Deep onto Surface Structure to those mapping from Surface Structure to Logical Form.

Recently, Bresnan (1976a) has presented a somewhat different formulation of the A/A Condition, "The Relativized A-over-A Principle", whose purpose is to allow rules to apply to maximal phrases with respect to "context" elements. In giving this formulation, Bresnan assumed essentially the transformational formalism of Peters and Ritchie (1973),

in which transformations are given as n-term Boolean combinations of categories C, where C ranges over the non-terminal vocabulary. Thus, QR, which might be stated informally in this notation as (A10), is strictly formalized in (A11):

$$(A10) \quad [{}_S^X [{}_{NP}^Q - Y] Z]$$

$$(A11) \quad S_{1-4}^4 \ \& \ NP_{2-3}^4 \ \& \ Q_{2-2}^4$$

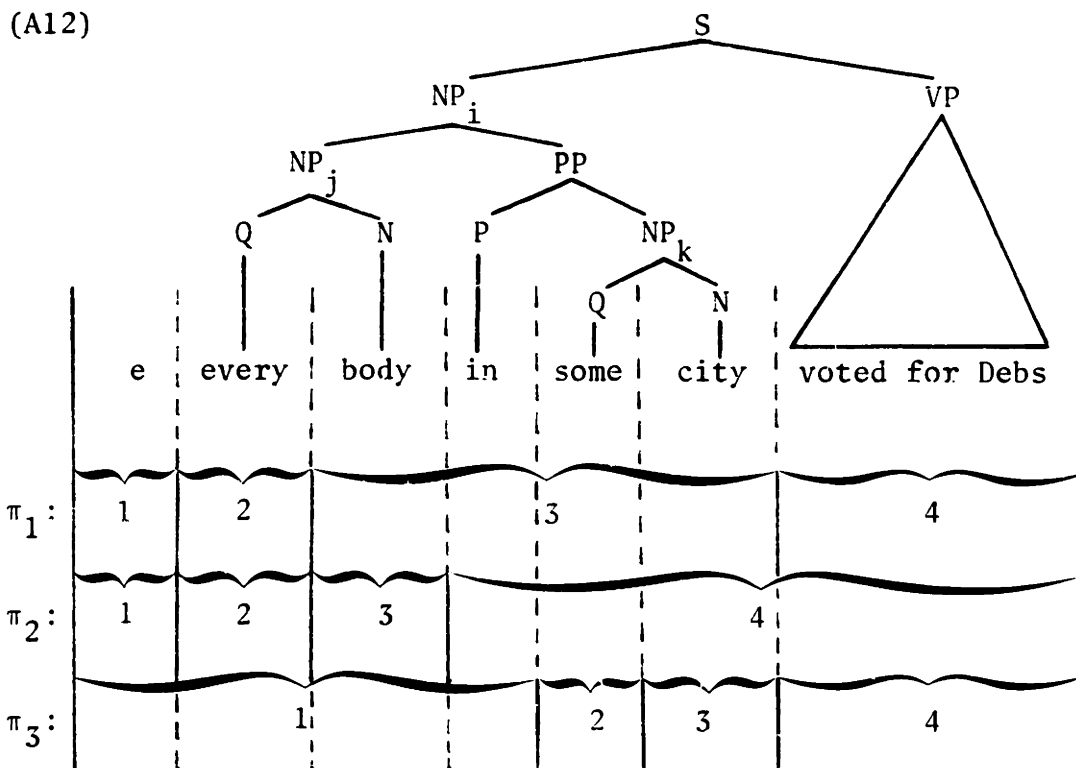
(A11) states that QR is a 4-factor transformation, such that the 1st through 4th factors are an S, the 2nd and 3rd factors an NP and the 2nd factor a Q.

With respect to this formalism, Bresnan defines the notion "target" predicate as essentially those predicates on which the structural change of the rule is defined, i.e., those elements which are actually affected by the rule. A "context" predicate "...is any predicate \mathcal{B}_{t-u}^n , other than a target predicate, whose term indices (t,u) are not included within those of a target predicate...Context predicates describe things "outside of" the target predicates." (p. 11).²⁹

Given these definitions, the Relativized A-over-A Principle" states that a "transformation $\tau = (\mathcal{E}, \mathcal{M})$ apply under a proper analysis π that is maximal relative to all proper analyses that agree with π on all context predicates \mathcal{E} ." (p. 16), (where \mathcal{E} is an n-term structural condition and \mathcal{M} is an n-term transformational mapping.)

Bresnan's formulation of the A/A Condition is intimately connected to a Peters and Ritchie-type formalism, which is significantly less

restrictive than the formalism outlined in Chapter One. One may raise the issue whether in this less restrictive formalism it could be shown that, assuming QR as stated in (A11), the problem facing the A/A Condition could be surmounted by the Relativized A-over-A Principle. To see if this is the case, consider as an example (A12), which indicates the three possible analyses of structure (A5):



Since QR does not contain any relevant context predicates, (aside from 'S₁₋₄⁴'), the Relativized A-over-A Principle mandates that QR simply apply under the maximal analysis of (A12); that is, to the maximal noun phrase which satisfies the predicate 'NP₂₋₃⁴' in (A11). This means that QR may only apply to NP_i, under analysis π_1 , since NP_i properly contains both NP_j and NP_k. It therefore explicitly prohibits QR from applying to either

of these noun phrases. But, if QR cannot apply to NP_k , then it is not possible to generate a well-formed logical form from (A12), since the structure generated (which is (A6)), does not satisfy the Condition on Quantifier Binding. This situation is not alleviated if we assume (A7) or (A8) as the structure of PP-complements. In each of these, since NP_i is maximal vis-a-vis NP_k , QR will only be applicable in these structures under an analysis in which NP_i is affected by the structural change of the rule.

Thus, the same problem arises under Bresnan's Relativized A-over-A Principle, as does under the A/A Condition: It incorrectly predicts that PP-complement constructions, containing an embedded quantifier, should be ill-formed. The significance of the failure of the Relativized A-over-A Principle to account for the functioning of QR in PP-complement constructions is that, even if QR is stated in a more expressive formalism, it is still not possible to correctly constrain its functioning in this construction. Thus, enriching the expressive power of transformational grammar, in this case, does not lead to a theory which is empirically more adequate. Like the A/A Condition, then, the Relativized A-over-A Principle is not extendable to rules mapping from Surface Structure to Logical Form, which is in marked contrast to the generality of the Condition on Analyzability.

FOOTNOTES

Chapter Two

- 1 There are a number of arguments which can be made for and against these structures. For example, Jackendoff (1971) argues in favor of the \bar{N} -structure (2.11) on the basis of sentences like (i):

(i) I've seen one review of a book by three
authors, but I wouldn't want to see
another

((i) is from Akmajian (1974), who invokes Jackendoff's argument.) Jackendoff holds that (i) is derived via deletion of 'a review of a book by three authors' from the 'but' clause. On the assumption that deletion rules affect constituents, 'a review of a book by three authors' must form a constituent, presumably an \bar{N} . On the other hand, examples such as those in (ii) indicate the independent need for the structure in (2.10),

- (ii)a Walter Cronkite in New York reported on
another cease-fire in Beirut
- b Jimmy Carter from Georgia was elected President
- c Sy Hersh of the New York Times broke the CIA story

a position which receives further support from an argument presented in Emonds (1976). He argues (pp. 170-1) that only an NP-PP structure like (2.10) can account for the existence of sentences like (iii),

since it allows, in contrast to an \bar{N} structure, NP conjunction. The

- (iii) The weather and the mode of dress in
most areas are compatible

structure of (iii) under this analysis is (iv):

- (iv) $[_S[_{NP}[_{NP}[_{NP}\text{the weather}] \text{ and } [_{NP}\text{the mode of dress}]]$
 $[_{PP}\text{in most areas}]][_{VP}\text{are compatible}]]$

The existence of (iii), though, should not be thought to preclude the possibility of \bar{N} conjunction, in addition to NP conjunction. The existence of the former structure is illustrated by examples like (v):

- (v) The rainy weather in the spring and sunny
weather in the summer leads to a bountiful
harvest

The indeterminacy of these arguments may simply indicate that neither (2.10), (2.11) nor (2.12) is the structure of PP-complement constructions, i.e., all of them may be possible noun phrase structures in English. For example, Sag (1976) has argued for just this, on the basis of pied-pipping phenomena in relative clauses. These differing structures may also be correlated with differences in the semantic interpretation of PP-complements. Thus, Joan Bresnan (personal communication) has suggested that restrictive prepositional phrase modifiers occur in structure (2.10), while complement prepositional phrase modifiers occur in the \bar{N} -structure

(2.11). As support for this claim, consider the examples in (vi):

- (vi)a Every student in a class that he feels secure
in will contribute
- b Every student of a subject that he enjoys
will contribute

In (vi)a the pronoun 'he' can be construed as a variable bound by the quantifier 'every', but in (vi)b, this reading is not available. This follows, presumably, from the fact that 'every student' forms a noun phrase in (vi)a, (which is assigned structure (2.10)), which may serve as the antecedent to 'he', but not in (vi)b, where 'every' and 'student' do not form a constituent. However, this congruence of syntactic form and semantic interpretation apparently does not hold in all cases. For example, the sentences in (vii) are parallel to (vi)b, and

- (vii)a Every owner of a car which he has driven
for more than five years should sell it
- b Every holder of a visa which he obtained
overseas may enter the country

presumably have an \bar{N} -structure. But they both allow a bound interpretation. Thus, it may be the case that the range of anaphoric possibilities in sentences like (vi) and (vii) is dependent upon more subtle considerations than simple differences in their putative surface structures.

- 2 Just as (2.11) above is not the only possible structure of PP-complements in subject position, so (2.23) is not the only possible structure for these constructions in object position. Thus, besides (2.23), we have (i) and (ii) as possible verb phrases:

(i) $[_{VP}[_{V}\dots][_{{NP}}[_{{NP}}\dots][_{{PP}}\dots]]]$

(ii) $[_{VP}[_{V}\dots][_{{NP}}[_{{Q}}\dots][_{{N}}\dots][_{{PP}}\dots]]]$

In what follows, we will utilize an \bar{N} -structure for illustrative purposes, bearing in mind that the same logical form is generable from either of the alternatives, as illustrated for PP-complements in subject position in section 2.2.

- 3 (2.33) should not be confused with (i), which is the passive of (ii).

(i) John was met by everybody, in some Italian city

Notice that neither (i) nor (ii) has the interpretation represented

(ii) Everybody met John, in some Italian city

by (2.34). This is because it is not possible to generate a linked logical form from the surface structure of either (i) or (ii), since in neither case do the two quantifier phrases form a single nominal

constituent. The only logical forms which are generable from their surface structures are non-linked.

- 4 There are examples of sentences containing NP-PP sequences, containing 'for', which passivize:

(i) A cake for Mary was baked by Jack

Notice crucially, though, that (i) does not have a dative interpretation. Thus, compare (i) to (ii), whose surface structure may be either (iii) or (iv):

(ii) Jack baked a cake for Mary

(iii) [_SJack baked [_{NP}a cake][_{PP}for Mary]]

(iv) [_SJack baked [_{NP}a cake [_{PP}for Mary]]]

(ii) is ambiguous between a dative reading, which corresponds to (iii), and a non-dative reading, corresponding to (iv). On the dative reading, (ii) essentially means Jack wanted to give Mary a present, so he baked her a cake, while on the non-dative reading, it means that Jack baked a cake intended for Mary, (e.g., Harry wanted to give Mary a gift, so he asked Jack to bake him a cake; Jack himself may have had no idea whom the cake was actually for). (i) has only the latter reading, as we would expect, since it is derived from (iv). On the dative interpretation of (ii), represented by (iii), 'a cake'

and 'for Mary' do not form a noun phrase constituent. It therefore has no passive counterpart with the form of (i).

- 5 While the structure of (2.46) only yields an ambiguity, sentence (i)

(i) John recorded one song on every album

has a third ambiguity associated with it, in which it asserts that for each album, there is one song on it which was recorded by John. The remainder of the songs on each of the albums may have been recorded by other artists. This reading is represented by the linked logical form in (ii), which is generated from the surface structure in (iii), in which the post-verbal noun phrase and prepositional

(ii) $[_S[_{\text{every album}}]_{\beta} [_S[_{\text{one song on } \beta}]_{\alpha} [_S \text{John recorded } \alpha]]]$

(iii) $[_S \text{John recorded } [_{NP}[_{NP} \text{one song}][_{PP} \text{on every album}]]]$

phrase form a PP-complement construction. From the structure in (iii), another instance of wh-movement can be generated:

(iv) *Which song on every album did John record?

(iv) is to be compared with (v), in which the quantified noun phrase has been replaced by a referring expression. The paradigm illustrated

by (iv) and (v) parallels that illustrated by (2.43) and (2.44), an explanation for which is provided immediately below.

(v) Which song on the top ten did John record?

- 6 Note that the scope properties of these sentences are the same if we substitute either 'all' or 'each' for 'every'. Thus, the sentence in (i) displays the same ambiguity as (2.46), while the sentences

- (i)a John recorded one song on each of the albums
 b John recorded one song on all of the albums

in (ii) display the same lack of ambiguity of (2.49)a.

- (ii)a Which song did John record on each of the albums?
 b Which song did John record on all of the albums?

- 7 Notice that this is an empirical argument for taking QR to be an adjunction to S, rather than \bar{S} . If it were an adjunction to \bar{S} , then the logical forms of (2.49)a and (2.49)b would be (i) and (ii), respectively:

(i) $[\bar{S}[\text{every album}]_{\alpha} [\bar{S}[\text{COMP}^{\text{which song}}]_t [S[\text{did John record } t \text{ on } \alpha]]]]$

(ii) $[\bar{S}[\text{one song}]_{\alpha} [\bar{S}[\text{COMP}^{\text{which album}}]_t [S[\text{did John record } \alpha \text{ on } t]]]]$

Given these logical forms, it follows that (2.49)a should be the question corresponding to (2.48), while (2.49)b is the question corresponding to (2.47). But this is contrary to fact: (2.49)a is the question corresponding to (2.47), while (2.49)b corresponds to (2.48). Thus, assuming that QR is an adjunction to \bar{S} cannot explain the semantic relationship between the wh-question in (2.49), and (2.46) from which they are derived. The explanation of this relationship follows directly, though, from QR being an adjunction to S.

- 8 This property of wh-quantifiers, that they take maximally wide scope, is not limited to their occurrence in single clause sentences; they also take maximally wide scope in matrix complement constructions, for example. Thus, notice that in (i), the wh-quantifier takes wider scope than 'every', (since this question is an inquiry into the identity

(i) Who did everyone say that Bill saw?

of a specific person, of whom everyone said that Bill saw him). In a comparable sentence, in which a quantifier appears in the underlying position of the wh-word in (i), 'every' is construed as taking wider scope:

(ii) Everyone said that Bill saw someone

In (ii), 'some' is normally construed as taking narrower scope than

'every', since the sentence is true even if there is no person in particular, of whom everyone said that Bill saw him. The scope relations in (i) follow from the fact that 'who', which is in COMP position, c-commands 'everyone', which in logical form is adjoined to the matrix S. In the logical form associated with (ii), as is shown in Chapter Three below, 'some' is adjoined to the complement S, while the quantifier 'every' is still adjoined to the matrix S. Since 'every' c-commands 'some' in the logical form of this sentence, the former has wide scope over the latter. The difference in the scope properties of the sentences in (i) and (ii), therefore, follows from the notion of 'scope' being defined in terms of c-command at the level of Logical Form.

- 9 It has been pointed out to me (by J. Bresnan) that there exist cases like (i), whose structure is identical to the surface structure of

$$(i) \quad [\bar{S}[_{COMP} \text{how many representatives from each city}]_t \\ [_S t \text{ will vote for the amendment}]]$$

sentences like (2.51)b - (2.54)b, viz., (2.55). (i), though, is seemingly well-formed, as compared to (2.51)b - (2.55)b. Notice, however, that the interpretation of (i) is somewhat different from that of the latter sentences. In (2.51)b - (2.54)b, the intended interpretation is one in which the wh is construed as having scope wider than the

normal quantifier in the sentence. What we have seen though is that it is not possible to generate a well-formed logical form with these scope relations. On the natural interpretation of (i), on the other hand, the wh-quantifier 'how' is construed as having scope narrower than the normal quantifier, 'each'. Thus, (i) may be logically paraphrased as 'For each city, how many representatives from it will vote for the amendment'. It is possible to generate a logical form which displays these scope relations if we take literally the idea that interrogative wh-words are quantifiers. As such, they may be affected by QR. Under this assumption, QR may apply in (i) to the phrase 'how many representatives from each city', and adjoin it to the S node. This generates (ii):

$$(ii) \quad [\bar{S}[\text{COMP}^t]_t \quad [S_i [\text{how many representatives from each city}]_t \quad [S_j t \text{ will vote for the amendment}]]]$$

In (ii), QR may affect the quantified phrase 'each city', and adjoin it to S_i , which is the S node which arises from the adjunction of the wh-phrase. This gives (iii):

$$(iii) \quad [\bar{S}[\text{COMP}^t]_t \quad [S[\text{each city}]_\alpha \quad [S_i [\text{how many representatives from } \alpha]_t \quad [S_j t \text{ will vote for the amendment}]]]]]$$

Notice that (iii) is a well-formed logical form, satisfying the Condition on Proper Binding. This is because all of the variables

which occur in argument positions are c-commanded, and hence properly bound, by the phrases which bind them. (The variable 't', occurring in the COMP position, does not constitute a violation of this condition, since COMP is not an argument position.) Interestingly, the structure generated under the assumption that QR may apply to wh-phrases is an inversely linked logical form, structurally identical to the logical forms associated with non-wh PP-complement constructions. And, parallel to those structures, it is the quantifier which is embedded as the object of the preposition in surface structure which has wider scope in logical form.

Notice, that even under this extended assumption, it is still not possible to generate a logical form in which the wh-quantifier has wider scope. Thus, in (ii), if QR were to adjoin the phrase 'each city' to S_j rather than S_i , the resulting structure, (iv), would still violate the Condition on Proper Binding, since it contains an

$$(iv) \text{ } *[\bar{S}[\text{COMP } t]_t [S_i [\text{how many representatives from } \alpha]_t \\ [S[\text{each city}]_\alpha [S_j t \text{ will vote for the} \\ \text{amendment}]]]]]$$

unbound variable ' α ', which is in an argument position.

The assumption that QR affects wh-phrases may also explain the apparent ambiguity of the examples in (v):

$$(v)a \quad [\bar{S}[\text{COMP } \text{what}]_t [S \text{did each senator say } t]]$$

(v)b $[\bar{S}_{\text{COMP}}^{\text{where}}]_t [{}_S \text{did everyone go } t]]$

If we allow QR to apply to wh-phrases, then it is possible to generate from the surface structures in (v) two distinct logical forms. To see this, consider (v)a. QR may apply in this structure to 'each senator', adjoining it to S, deriving (vi):

(vi) $[\bar{S}_{\text{COMP}}^t]_t [{}_S [\text{each senator}]_\alpha [{}_S [\text{what}]_t [{}_S \text{did } \alpha \text{ say } t]]]]$

Alternatively, a logical form could be derived by QR affecting both the phrase 'each senator', and the wh-phrase. QR applying to both of these phrases generates (vii):

(vii) $[\bar{S}_{\text{COMP}}^t]_t [{}_S [\text{each senator}]_\alpha [{}_S [\text{what}]_t [{}_S \text{did } \alpha \text{ say } t]]]]$

Both (vi) and (vii) are well-formed representations at the level of Logical Form (note, once again, in regard to (vii), that COMP is not an argument position). (vi) represents the reading in which the wh-phrase has wider scope; an appropriate reply to (v)a under this reading would be "That he would vote for the Canal treaty". (vii), on the other hand, represents a reading in which the wh-phrase has narrower scope. An appropriate reply here would be "Proxmire said that he would vote for the treaty, Goldwater said he wouldn't..."

What these observations indicate is that in some (but not all)

wh-constructions, it is possible to construe the wh-word as having narrower scope than another (normal) quantifier in the sentence.

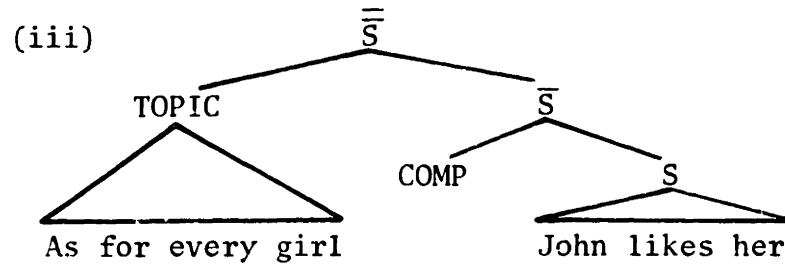
While the markedness conditions which govern the existence of this reading are not clear, and remain a point for further inquiry, it is possible on the assumption that wh is literally a quantifier, to generate structures which represent this narrow scope reading of wh. Notice that the significance of this result is that it shows that in order to generate the appropriate range of logical forms for wh-constructions, QR must apply to wh-phrases which are contained in COMP. Since surface structure is the level at which wh-constructions have this property, this analysis of wh-constructions is an argument that rules mapping onto logical form apply to surface structures, and not to some other level of linguistic representation.

- 10 This explanation of the unacceptability of the (b) examples in (2.51) - (2.54) may also shed some light on the unacceptability of the sentences in (i), as opposed to those in (ii):

- (i)a *As for every girl, John likes her
- b *As for a girl, John likes her
- c *As for somebody, John likes her
- (ii)a As for that girl, John likes her
- b As for Zelda, John likes her
- c As for her, John likes Mary better

An explanation for this difference between (i) and (ii) follows if we assume that topic phrases like those in (i) and (ii) are constituents

of a pre-sentential TOPIC node, which is introduced by the phrase structure rule $\bar{\bar{S}} \rightarrow \text{TOPIC} - \bar{S}$. (This is essentially the position suggested in Van Riemsdijk and Zwarts (1974), Chomsky (1977a) and Koster (1977a)). The surface structure of these sentences is then as in (iii):



In (iii), QR would apply to the noun phrase 'every girl', which is a constituent of TOPIC, adjoining it to S, generating the logical form (iv):

$$(iv) \quad [\bar{\bar{S}}_{\text{TOPIC}}^{\text{as for } \alpha}] [\bar{S}_{\text{COMP}}^e] [S_{\text{every girl}}]_{\alpha} [S \text{ John likes her}]]]]$$

(iv), though, is ill-formed, since the variable ' α ' is not properly bound by the quantifier 'every'. The sentences in (i), therefore, are ill-formed, in comparison to those in (ii), because it is not possible to associate them with logical forms which satisfy the Condition on Proper Binding.

11 This is with normal intonation, i.e., primary stress on the

initial noun phrase, as in (i):

- (i)a *Some people in which city did you meet?
 b *Some people in which city voted for Debs?

Notice that if (i)b is contrastively stressed, as in (ii)b, it becomes acceptable, while (ii)a with the same stress pattern is

- (ii)a *Some people in which city did you meet
 b Some people in which city voted for Debs

still unacceptable. In the structure from which (i)a is derived, though, the more deeply embedded noun phrase may be contrastively stressed:

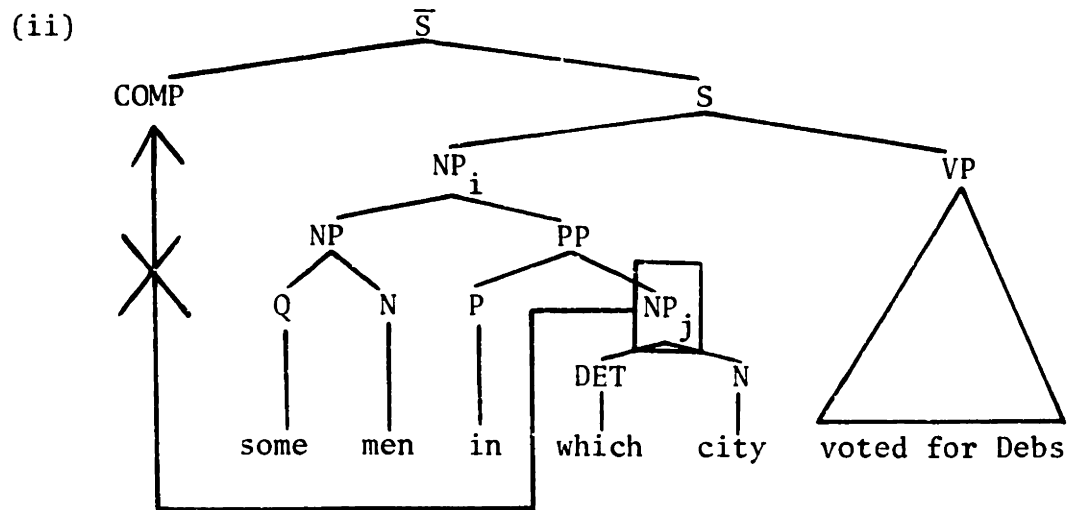
- (iii)a You met some people in which city
 b *You met some people in which city

What these examples show is that sentences like (i)a and (i)b are acceptable, with contrastive stress, if they have not undergone wh-movement.

12 There is another sentence, (i), which is derived from the structure,

- (i) * $[_S[_{COMP} \text{which city}]_t [_S \text{did} [_{NP} \text{some men in } t] \text{ vote for Debs}]]$

(ii), underlying (2.59)b.

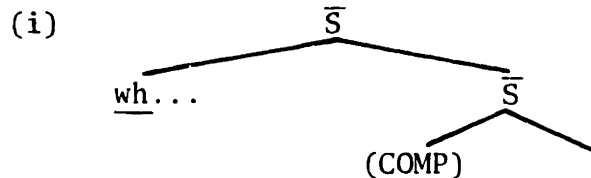


(ii) is derived by wh-movement applying to NP_j . But, as has been pointed out by Chomsky (1977), this movement results in a violation of the Subjacency Condition, because there are two bounding nodes, NP_i and S, intervening between NP_j and COMP. For more discussion of the question of bounding nodes, see Chapter Three.

- 13 In defending the position that wh-movement is an adjunction to S, one could seek to rule out (2.62) as ill-formed on the basis of a special stipulation to the effect that a logical form containing a wh-quantifier is well-formed only if that quantifier has maximally wide scope. This stipulation would account for the facts at hand: It would rule out (2.62) as ill-formed, since in that structure the wider scope quantifier is 'some', not wh. Making this ad hoc stipulation, though, would be an essentially regressive step, since under the assumption that wh-phrases are moved into COMP, the fact

that wh-quantifiers have maximally wide scope follows as a consequence of the theory. Thus, under the assumption that wh-movement is an adjunction to S, it is necessary to stipulate what is otherwise explained by the theory.

- 14 Assuming this rule does not eliminate the possibility that wh-movement is an adjunction. For example, Bresnan (1976a) suggests that wh-phrases are adjoined to \bar{S} , as in (i):



It is clear that identical empirical results follow from assuming this structure as from assuming that wh-phrases are moved into COMP, vis-a-vis sentences in which quantified noun phrases are embedded in the wh-phrase, (i.e., (2.51)b - (2.54)b and (2.59)). Thus, if (i), for independent reasons, turned out to be a possible surface structure for wh-construction, then our argument is weakened, from showing that wh-phrases are moved into COMP, to showing that they cannot be adjoined to S.

- 15 I have assumed in (2.65) that the prepositional phrase 'in which city' is a constituent of VP. It may be the case that this PP is actually adjoined to S. Regardless of which structure may be correct, the

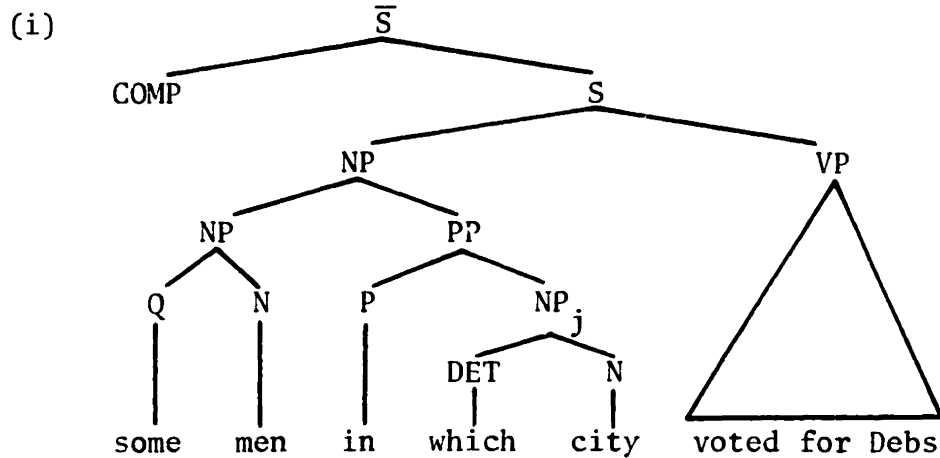
argument presented in the text follows. This is because in neither structure does the noun phrase 'some men' and the prepositional phrase 'in every city' form a PP-complement. For a discussion of the constituency of sentence-final prepositional phrases, see Williams (1974) and Reinhart (1976).

- 16 In the generation of (2.63)a and (2.64)a, we are assuming, along lines originally suggested in Ross (1967), that there is a general convention which (optionally) allows a PP dominating a wh-phrase to be moved into COMP. This convention is quite general, and not limited to cases where the PP immediately dominates the wh-phrase, as in (2.63)a and (2.64)a, which is shown by examples like (i):

- (i) After he heard which pianist did John buy
a Bosendorfer?

For recent discussion of the issue of pied-piping, see Woisetschlaeger (1976), Sag (1976) and Bresnan (1976a).

Notice that it could be argued that (2.63)a, rather than being generated from (2.65), is actually derived by extraction of the embedded PP in (i):



This argument, though, runs into serious difficulty upon consideration of the interpretation of (2.63)a. Note that the interpretation of this sentence is parallel to that of (ii), where the quantified

(ii) In which city did John and Harry vote for Debs

noun phrase has been replaced by proper names. (ii) must be derived from a structure like (2.65), since as (iii) shows, proper names may not serve as heads to quantified complement prepositional phrases.

(iii) *John and Harry in some city voted for Debs

This fact bears on the significance of the perceptually based constraints suggested in Kuno (1973). According to this theory, the unacceptability of example (i) in fn. 12, repeated here as (iv), is a function of "The Incomplete Subject Constraint", given in (v), which is a sub-case of the more general "Clause Non-final Incomplete

(iv) *Which city did some men in vote for Debs

(v) The Incomplete Subject Constraint

It is not possible to move any element of a subject noun phrase/clause if what is left over constitutes an incomplete noun phrase/clause

(p. 380)

Constituent Constraint", given in (vi):

(vi) The Clause Nonfinal Incomplete Constituent Constraint

It is not possible to move any element of a phrase/clause A in the clause non-final position out of A if what is left over in A constitutes an incomplete phrase/clause.

Under this analysis, it is predicted that (iv) is ill-formed, because the phrase which remains after wh-movement is an incomplete prepositional phrase; this prediction the Clause Nonfinal Incomplete Constituent Constraint shares with the Subjacency Condition, (cf. fn. 12). Unlike the Subjacency Condition, though, it allows the extraction of the entire embedded PP in (i), 'in which city', since the resulting sentence, (2.63)a, (repeated here as (vii)), does not contain an incomplete

(vii) In which city did some men vote for Debs

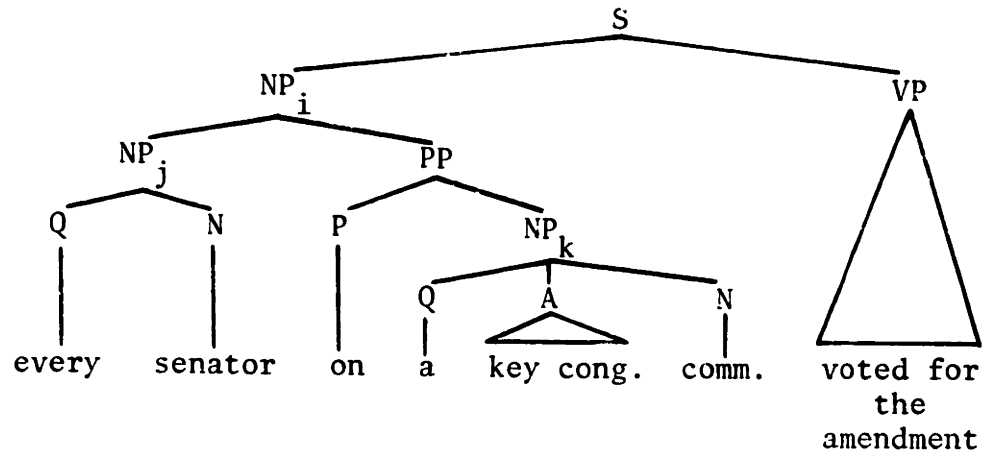
constituent. But, in (vii), the PP 'in which city' is not construed

as underlyingly a constituent of the subject NP, an interpretation which, according to Kuno's constraints, should be possible. Rather, as we have just seen, this PP is interpreted as underlyingly clause-final; i.e., (vii) is generated from (2.65), not (i). Kuno's conditions, therefore, incorrectly predict that (vii) can be generated from (i). His analysis thus seems incapable of accounting the possibilities of wh-movement from PP-complement constructions.

- 17 Examples of this type were first pointed out to me by J. Bresnan.
- 18 While in Chapter Four we will endeavor to sketch an account of the marked (relative) interpretation of PP-complement constructions, it should be noted here that the existence of this reading cannot be accounted for by some modification of the theory of sentence grammar, given our other assumptions. For example, one could hold that a logical form, in which the embedded quantifier has narrower scope than the head quantifier, could be generated by abandoning the immediate domination clause in The Condition on Analyzability. This would presumably allow the generation of (i) from (ii), by QR affecting NP_j and NP_k :

$$(i) \quad [{}_S[\text{every senator}]_{\alpha} [{}_S[\text{a key cong. comm.}]_{\beta} \\ [{}_S\alpha \text{ on } \beta \text{ voted for the amendment}]]]$$

(ii)



While (i) is presumably a well-formed logical form, (it satisfies the Condition on Proper Binding), it is not a logical form of sentence (iii):

(iii) Every senator on a key congressional committee voted for the amendment

The reason for this concerns the properties of a quantifier 'a' in this sentence, under the marked interpretation, where it has the force of a universal (rather than existential) quantifier; in a sense, it is interpreted like 'any'. This is a common feature of relative clauses, (compare (iii) to (iv)), a fact which follows

(iv) Every senator who is on a key congressional committee voted for the amendment

from 'a' in (iv) only having scope with respect to the embedded relative clause. Thus, the converted logical

form for (iv) is something like (v):

$$(v) \quad [_S \forall \alpha [_S [_S \alpha \text{ is a senator}] \ \& \ [_S \exists \beta [_S [_S \beta \text{ is a key congressional committee}] \ \& \ [_S \alpha \text{ is on } \beta]]] \rightarrow [_S \alpha \text{ voted for the amendment}]]]$$

In (v), since the scope of the existential quantifier is only the antecedent of the conditional, it is equivalent to (vi), where the quantifiers are in prenex form:

$$(vi) \quad [_S \forall \alpha [_S \forall \beta [_S [_S \alpha \text{ is a senator}] \ \& \ [_S [_S \beta \text{ is a key congressional committee}] \ \& \ [_S \alpha \text{ is on } \beta]]] \rightarrow [_S \alpha \text{ voted for the amendment}]]]$$

In Chapter Four, it will be argued that the logical form representing the marked interpretation of (iii) is essentially identical to (v), accounting for why 'a' has the force of a universal quantifier in this case, caeteris paribus. This is in contrast to the sort of converted logical form associated with (i), which is (vii):

$$(vii) \quad [_S \forall \alpha [_S [_S \alpha \text{ is a senator}] \rightarrow [_S \exists \beta [_S [_S \beta \text{ is a key congressional committee}] \ \& \ [_S \alpha \text{ on } \beta \text{ voted for the amendment}]]]]]]]$$

(vii), though, is not equivalent to (viii), in which the quantifiers are prenex, since the scope of existential quantifier in (vii) is not

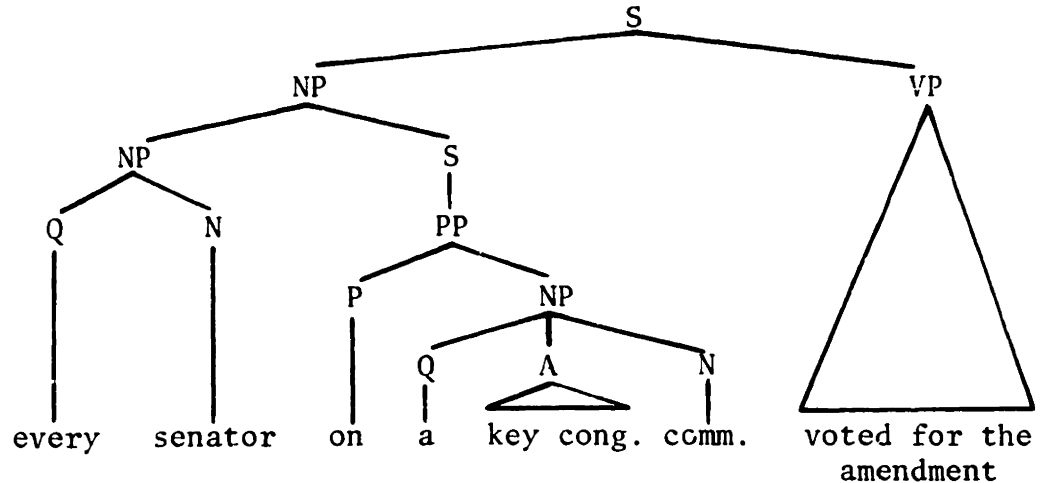
limited to the antecedent of the conditional; indeed, its scope is the consequent. Therefore, the quantifier 'a' in (i) cannot have the

$$(viii) \quad [_S \forall \alpha [_S \forall \beta [_S [_S \alpha \text{ is a senator}] \rightarrow [_S [_S \alpha \text{ is a key cong.} \\ \text{comm.}] \& [_S \alpha \text{ on } \beta \text{ voted for the amendment}]]]]]$$

force of a universal quantifier, only that of an existential quantifier. But, then, (i) cannot be the logical form of the "marked" interpretation of (iii), since under that reading, the quantifier 'a' has the force of a universal quantifier. Thus, it is not enough to simply be able to derive a logical form for (iii) in which the embedded quantifier has narrower scope than the head quantifier, by rejecting the Condition on Analyzability. Indeed, it is this independent principle of grammar which explains why sentences like (iii) never have the interpretation represented by (i). To reject it would lead to a loss in both the descriptive and explanatory adequacy of the theory. (This argument was brought to my attention by S. Bromberger.)

It might be assumed that, while the marked case in PP-complement constructions cannot be directly generated by modification of the grammatical principles, perhaps it could be directly generated by modification of some aspect of surface structure. For example, it could be held that (iii) is ambiguous at Surface Structure, being associated not only with a structure such as (ii), but also with a "reduced relative" structure, along the lines in (viii):

(viii)



This structure, (which may be derived by deletion of wh+be from the structure underlying (iv)) would account for why in sentences like (i) the marked interpretation is a relative interpretation; it is because, when they have this structure, they are, in fact, relative clauses.

This account of the ambiguity of sentences like (i), though, cannot be correct, since there are sentences like those in (ix), which are ambiguous, but which cannot be reduced relatives, viz., the

- (ix)a Some benefactor of every worthy cause is a happy man
- b Every patient with every non-contagious disease will be released from care

ill-formedness of the examples in (x), as compared to (iv):

- (x)a *Some benefactor who is of every worthy cause is a happy man

- b *Every patient who is with every non-contagious disease will be released from care

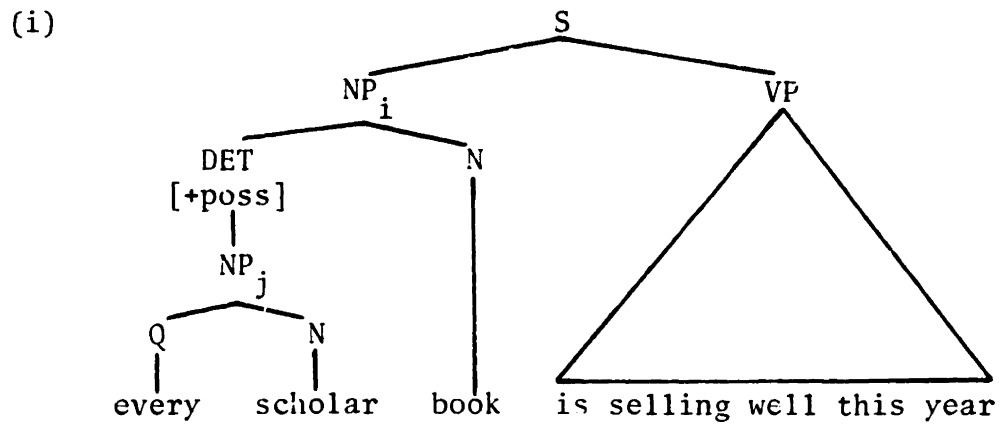
Thus, a theory which holds that the existence of the relative interpretation is a function of a surface structure ambiguity cannot be correct, since it would incorrectly predict that sentences like (ix) are unambiguous.

It is apparent, therefore, that the marked interpretation is not describable by making some adjustment either in the theory of sentence grammar, or in the nature of the surface structures associated with these sentences. Rather, it is necessary to look outside the domain of sentence grammar to account for this interpretation of PP-complement constructions, a task to which we will turn our attention in Chapter Four.

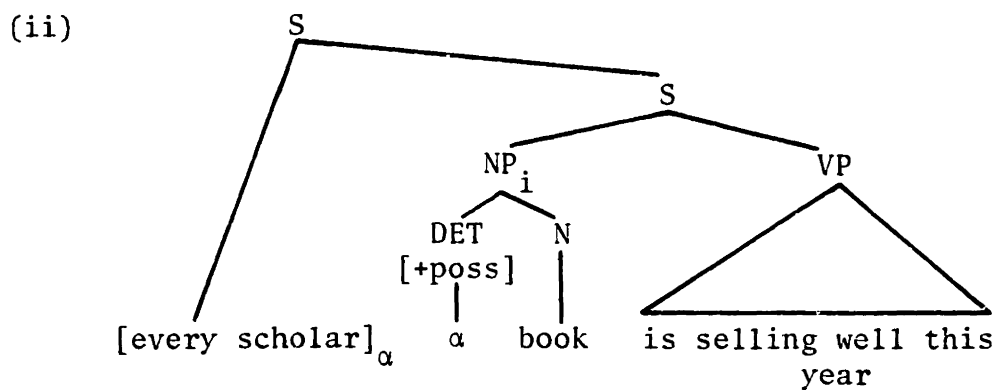
- 19 Notice that this is a counter-argument to a suggestion in Chomsky (1955) [p. 281 - (1975) edition], that possessive noun phrases are constituents of the pre-nominal adjective phrase. This is because, if this were the case, then we would expect that the interpretation of possessives should be parallel to the interpretation of structures like (2.85), containing real adjectives. But, as we have just seen, there are significant differences in the interpretation of (2.84), as compared to (2.85), which are not directly explicable if the possessive phrase appeared in the pre-nominal adjective position.

- 20 In what follows, we will assume that the possessive morpheme is not

present in surface structure, but that it is inserted by a rule mapping from SS to PI, the level of phonological interpretation. Thus, the surface structure (2.89) is more correctly represented as (i):



Since the genitive case is, in surface structure, a feature of the determiner, extraction of NP_j by QR does not affect the possessive marker. Thus, the logical form generated from (i), by QR affecting NP_j , is (ii):



wh-phrases from PP-complements, (cf. fn. 12), it also permits wh-movement to affect a possessive NP, since it is not immediately dominated by another [+N]-phrase in (2.89). This would have the effect of deriving (i):

- (i) * $[_{\bar{S}}[_{\text{COMP}} \text{which author's}]_t [_{\text{S}} \text{did John like } [_{\text{NP}} t \text{ book}]]]$

But, just as in the case of the PP-complements discussed above, (i) is ill-formed for other reasons: it violates the Subjacency Condition. This is because there are two bounding nodes, S and NP, intervening between the wh-phrase in COMP and the trace which it binds. For further discussion of the issue of bounding nodes, see Chapter Three.

- 22 Notice, that in comparison to the derived nominals, a parallel ambiguity exists in gerundive nominals like (i):

- (i) Some company's refusing every merger offer
began a panic on the floor of the exchange

This indicates that the structure of gerundive nominals is parallel, in the relevant respects, to that of derived nominals; in particular, that their "subjects" are generated as constituents of DET. (This has been suggested recently by Schacter (1976)).

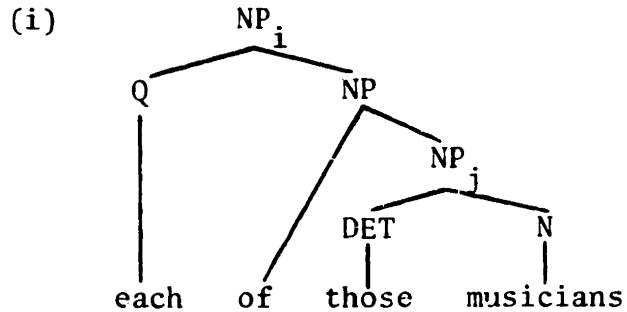
- 23 The condition in (2.105) is a sub-case of a more general semantically based condition governing the range of expressions which may occur

embedded as the complement of a partitive quantifier. Thus, the expressions which may occur in this position must, in some sense, be "non-individual". That is, not only are individual variables and proper names excluded, but so are singular noun phrases; compare the examples in (i) to those in (2.95):

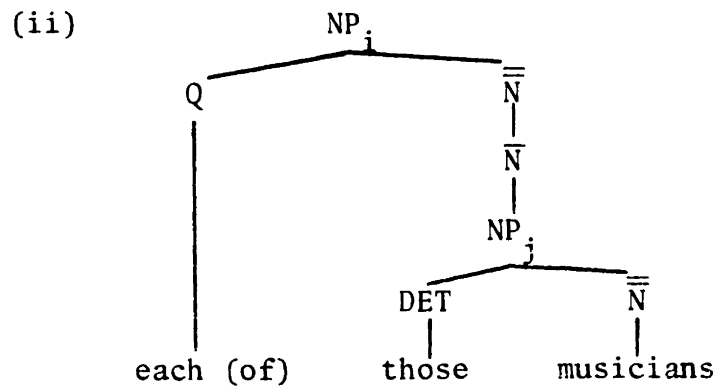
- (i)a *Each of John's friend
- b *Some of his flower
- c *All of these proof
- d *Many of the objection

Notice that it is not possible to account for the range of noun phrases which may occur in the embedded position in partitives on the basis of a distinction between singular and plural (and mass) noun phrases. This is because, as the examples in (2.96) show, plural (or mass) quantified noun phrases are barred from the embedded position. Therefore, the condition governing the range of possible partitive constructions must be stated at a level of linguistic representation, which we hold to be Logical Form, at which an appropriate notion of "non-individual" expression can be defined.

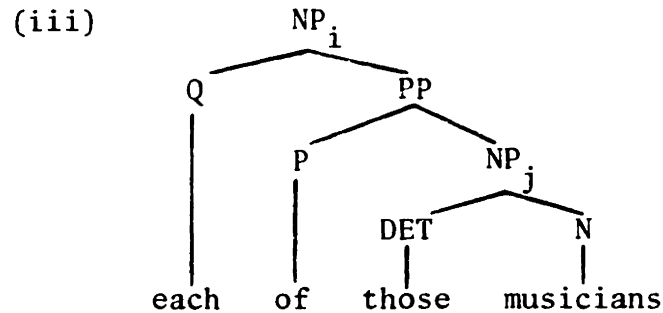
- 24 A number of possible surface structures for partitive constructions have been suggested in the literature. One possibility is that in (i), in which 'of' is Chomsky-adjoined to NP_j . (A variant of this structure, in which a rule of 'Of'-Insertion Chomsky-adjoins 'of' to the head Q, has been suggested in Akmajian and Lehrer (1976).) An



alternative is suggested in Selkirk (1977), who argues for a theory of noun phrase structure with greater hierarchical complexity than that presupposed by (i). The structure which she proposes for partitives is essentially (ii):



Another possibility is suggested in Jackendoff (1976), who holds, in contrast to (i) and (ii), that the 'of' phrase is a surface prepositional phrase:



(This structure seems the syntactically most suspect, since it should allow the extraposition of the prepositional phrase. The result of this operation, though, is ill-formed:

(iv) *Each appeared on stage of those musicians

(iv) is not generable from either (i) or (ii), since neither of these structures contains a constituent prepositional phrase.)

The characteristic which all of these structures share is that they contain a noun phrase embedded as a complement to a quantifier (and not to a noun, as in PP-complements). Since the argument in the text rests solely on this minimal property of partitive structure, it will hold regardless of which structure one assumes.

25 The arguments presented here support the position, held, for example, by Selkirk (1977) and Akmajian and Lehrer (1976), that noun phrases containing initial measure phrases are partitives:

(i) A number of the articles were censored

This is because, under this assumption, it follows that sentences such as (ii) should be unacceptable:

(ii) *A number of all articles were censored

The deviance of (ii) follows directly, if we assume that measure phrases are quantifiers, and are, therefore, structurally identical to partitives containing simple quantifier heads. The surface structure of (i), therefore, is essentially (iii):

(iii) $[_S [_{NP} [_Q [_{NP} \text{a number}]] \text{ of } [_{NP} \text{the articles}]]$
 $\text{were censored}]$

Given that (iii) represents the structure of noun phrases like that in (i), the ill-formedness of (ii) is simply a reflection of a general property of partitives, that they may not contain an embedded quantified phrase. (For a somewhat different account of the structure of measure phrases, which otherwise leads to the same result, see Selkirk (1977).)

- 26 When a wh-word is embedded in a partitive phrase, it is not possible to form a wh-question; neither (i) nor (ii) are well-formed:

(i) * $[_{\bar{S}} [_{COMP} \text{whom}]_t [_S \text{did John see } [_{NP} \text{many of } t]]]$

- (ii) * $[\bar{S}[_{COMP} \text{of whom}]_t [_S \text{did John see } [_{NP} \text{many } t]]]$

These structures are ill-formed because they violate the Subjacency Condition; in each case there are two bounding nodes, NP and S, intervening between the wh-phrase in COMP and the trace which it binds.

- 27 Notice that if a formulation of the A/A Condition accounted for all of these phenomena, it would be more general than the Condition on Analyzability, which, at best, can only account for the latter two. In the case of extraction of an embedded noun phrase from a PP-complement construction, a PP immediately dominates the NP affected by the rule. Thus, in principle, this NP should be extractable, deriving the ill-formed (i):

- (i) *Which city did some men in vote for Debs

But, as was pointed out in fn. 12, (i) is ruled out independently by the Subjacency Condition. Thus, the Condition on Analyzability, in conjunction with the (independently necessary) Subjacency Condition accounts for the same range of syntactic phenomena as the A/A Condition.

- 28 In fn. 12, it was noted that it is not possible to extract NP_k from structures like (A5), (A7) or (A8) by wh-movement, because of the

Subjacency Condition. To generate (A9), though, QR must apply to this noun phrase. In Chapter Three, it will be argued that the bounding nodes for rules mapping from Deep to Surface Structure are NP and S, while for those mapping from Surface Structure to Logical Form, the only bounding node is S. Since in these structures there is only a single bounding node, i.e., S, intervening between NP_k and the position to which it is moved, extraction of this NP by QR is legitimate, as far as the Subjacency Condition is concerned. For more discussion of the matter of the appropriate bounding nodes, see Chomsky (1973), (1977) and Chapter Three, below.

- 29 Note crucially that under the Relativized A-over-A Principle, maximality may only be judged with respect to external context elements, and not with respect to internal context elements. Thus in QR, as formulated in (A11), the term ' Q_{2-2}^4 ' cannot be a context predicate, since the term indices of this predicate are included within the term indices of the target predicate of the rule, which is ' NP_{2-3}^4 '.

Chapter Three: QUANTIFIERS IN COMPLEX SENTENTIAL CONSTRUCTIONS

Up to this point, we have been considering the properties of sentences consisting of a single clause, and we have seen that the nature of the logical forms characteristically associated with such sentences, containing both simple and complex quantified noun phrases, can be explained on the basis of the principles of core grammar, in particular, the Condition on Proper Binding and the Condition on Quantifier Binding. In this chapter we wish to extend the explanation of the properties of natural language quantification afforded by this theory beyond sentences of a single clause to multi-clausal constructions, and examine the range of possible logical forms associated with matrix-complement constructions, (e.g., 'that' and 'for' complements, indirect questions, etc.), relative clauses and subjectless complement constructions (e.g., raising, equi and control constructions). What we shall see is that this explanation follows, in part, from the Subjacency Condition, construed, along with the Predication Condition and the Condition on Quantifier Binding, as a condition on well-formed logical forms.

3.1 The Subjacency Condition. The Subjacency Condition was first formulated in Chomsky (1973), as a generalization of the account of the "upward-boundedness" of rightward movement rules presented in Ross (1967). It has subsequently been defended in Chomsky (1975a), (1976), (1977a), Akmajian (1975), Koster (1977b) and Van Reimsdijk (1977). Given our assumption that transformations apply freely, (in accordance with the trace theory of

movement rules), we will formulate the Subjacency Condition as a condition on well-formedness at the level of Logical Form. In order to do so, though, we need to define a preliminary notion, (where ' t^m ' and ' t^n ' represent distinct occurrences of the trace t):

A phrase X_t immediately binds a trace t^m iff X_t binds t^m , and there is no t^n , such that X_t c-commands t^n and t^n c-commands t^m .

Employing this concept, we define the Subjacency Condition as follows:

Subjacency Condition

A logical form with the structure

$\dots X_t \dots [_{\alpha} \dots [_{\beta} \dots [_{\gamma} t] \dots] \dots] \dots X_t \dots$
 (α, β bounding nodes), is ill-formed,
 where X_t immediately binds t .

(We assume that one or the other occurrence of ' X_t ' in this condition is non-null, and that X_t is either lexically filled or is itself a trace, i.e., lexically empty.) Thus, according to the Subjacency Condition, a structure at the level of Logical Form is well-formed only if every trace in that structure is subjacent to, and immediately bound by, a phrase which binds it. In this respect, we may think of the Subjacency Condition as applying pair-wise to co-indexed phrases (i.e., to a trace and its antecedent) in a structure.

Like the Condition on Proper Binding, the Subjacency Condition is a general condition on the output of the rules of core grammar. Hence, not only must the trace of a wh-phrase be subjacent to (and immediately c-commanded by) the wh-phrase which binds it, but so must the trace of a quantified noun phrase which has been affected by QR. The Subjacency Condition, though, differs from the Condition on Proper Binding in two significant respects. First, the former is less general than the latter. Where the Condition on Proper Binding is a condition on all elements which may ultimately be realized as bound variables (traces, pronouns, PRO, etc.), the Subjacency Condition is a well-formedness condition solely pertaining to traces. Second, the Subjacency Condition picks out, as ill-formed, a subset of these logical forms which otherwise satisfy the Condition on Proper Binding. That is, of those logical forms which satisfy the latter condition, only those in which traces are subjacent to the elements which immediately bind them are well-formed. In this sense, we may think of the Subjacency Condition as determining the subset of those structures at Logical Form, which otherwise satisfy the Conditions on Proper Binding and Quantifier Binding, which represent the unmarked cases of quantification. Given our theory of markedness, then, we would expect the Subjacency Condition to correlate to a significant empirical distinction, between the properties of quantification which hold universally of the constructions under consideration (i.e., those properties characterized by logical forms which are directly generated by core grammar), and those properties which arise under idiosyncratic conditions (i.e., those which are characterized by logical forms

which are not directly generable by core grammar.) It is to this distinction, and the explanation for it provided by the Subjacency Condition, that we now turn our attention.

3.2 Matrix-Complement Constructions. To begin, consider the sentences in (3.1), all of which contain quantified noun phrases embedded in \bar{S} -complements:

- (3.1)a Jones hissed that Smith liked every painting in
the Metropolitan
- b John quoted Bill as saying that someone had
left
- c His mother said loudly that everyone had
to go
- d Susan didn't forget that many people had
refused to contribute
- e Helen grieved that each of the monkeys had
been experimented upon
- f It is instructive for someone to play the
piece first
- g It's impossible for The Kid to fight a
contender
- h It's false that all the men left the party
- i John asked whether he had bought some shuttle-
cocks at Abercrombie's
- j Carol wondered why everyone was reading
Gravity's Rainbow
- k Mark regretted Sam's having invited so few
people

In all of these sentences the quantifier embedded in the complement clause is construed as having scope narrower than the matrix predicate. For example, take (3.1)a, containing the opaque predicate 'hiss'. It does not follow from (3.1)a (and 'Rembrandt's portrait of Aristotle is in the

Metropolitan') that Jones hissed that Smith liked Rembrandt's portrait of Aristotle; indeed, (3.1)a would be true even if Jones did not know of any particular painting that it was one of the paintings that Smith liked. Parallel observations could be made about all of the other examples, which also contain opaque predicates; in each of them the quantified phrases embedded in the complement clause is understood as having scope narrower than the matrix predicate.

What we wish to show in this section is that this fact follows from (and is hence explained by) the theory we are proposing here - in particular, from the Subjacency Condition. This is because the only type of logical form generable from the surface structures of matrix-complement constructions like those in (3.1), which satisfy this condition, is where the embedded quantifier is adjoined to the complement S node, and thus it has scope narrower than the matrix predicate. To see this, consider the derivation of the logical form associated with (3.1)a, from its surface structure, which is (3.2):

$$(3.2) \quad [_{S_i} \text{John hissed } [_{\bar{S}} \text{that } [_{S_j} \text{Smith liked } [_{NP} [_Q \text{every painting}]]]]]$$

Since we are assuming that QR applies without constraint, the quantified noun phrase 'every painting', may be adjoined either to S_i or to S_j . The former operation derives the structure in (3.3); the latter the structure in (3.4):

$$(3.3) \quad [_S [\text{every painting}]_{\alpha} [_{S_i} \text{John hissed } [_{\bar{S}} \text{that } [_{S_j} \text{Smith liked } \alpha]]]]]$$

$$(3.4) \quad [_{S_i} \text{John hissed } [_{\bar{S}} \text{that } [_{\bar{S}} [\text{every painting}]_{\alpha} [_{S_j} \text{Smith liked } \alpha]]]]]$$

Notice, crucially, that while (3.3) and (3.4) satisfy the Condition on Proper Binding (in each case the variable is c-commanded by the quantifier which binds it), it is only the latter structure which satisfies the Subjacency Condition. This is because in this structure there is only a single bounding node, namely S_j , intervening between the variable ' α ' and the phrase 'every painting' which binds it. (3.3), on the other hand, does not satisfy the Subjacency Condition, since there are two bounding nodes, S_i and S_j , intervening between ' α ' and 'every painting'. (3.3) therefore, is ill-formed, leaving (3.4), where the quantified phrase has narrower scope than an (opaque) matrix predicate, as the only logical form associated with sentence (3.1)a. Thus, it follows from the Subjacency Condition that in sentences like those in (3.1), with full \bar{S} -complements in surface structure, an opaque interpretation is always available.¹

It should be noted that this explanation, on the basis of the Subjacency Condition, holds, regardless of whether we assume that a structure in which the embedded quantifier takes wider scope is derived by a single operation of QR (as in (3.3)), or by "successive cyclic" applications. This latter mode of application derives (3.5):

$$(3.5) \quad [_{\bar{S}} [\text{every painting}]_{\alpha} [_{S_i} \text{John hissed } [_{\bar{S}} \text{that } [_{S_k} \alpha_i [_{S_j} \text{Smith liked } \alpha_j]]]]]]$$

(3.5) still violates the Subjacency Condition, since there are also two

bounding nodes, S_i and S_k (the latter being the result of adjoining the quantified noun phrase to S_i by the first application of QR), intervening between 'every painting' and the variable ' α_i ' which it immediately binds. Thus, the fact that quantifiers embedded in \bar{S} -complements always have an interpretation in which they are construed as having narrow scope, follows independently of whether or not QR applies cyclically.²

Thus, given the principles of sentence grammar, the only well-formed logical form which may be generated from the surface structure of sentences like (3.1) by QR is one in which the quantified noun phrase is adjoined to the S of which it is an immediate constituent. Thus, quantification is clause-bounded, in the unmarked case.³ Semantically, the significance of this result is that the unmarked interpretation of \bar{S} -complement constructions is the opaque interpretation, since, because of the Subjacency Condition, structures like (3.3) and (3.5)) are ill-formed. In other words, it is only a logical form corresponding to the opaque interpretation of matrix-complement constructions which is directly generable by the grammar. (We return to a discussion of transparency in this construction below.)

There are a number of interesting results which follow from quantification being clause-bounded. For example, it is possible to explain why it is that in sentences which are parallel to those of (3.1) except that the subject noun phrase contains a quantifier, the matrix quantifier is interpreted as taking wider scope than the complement quantifier. A number of examples are listed in (3.6):

- (3.6)a Someone hissed that Smith liked every painting
in the museum
b No one forgot that many people had refused to
contribute
c Everyone asked whether he had bought some
shuttlecocks at Abercrombie's

The interpretation of (3.6)a, for example, is parallel to that of (3.1)a; it can only be taken as asserting that there is a person such that he hissed that Smith liked every painting. It cannot be taken as asserting that for each painting in the museum, there is someone (or other) who hissed that Smith liked that painting. The reason for this state of affairs is that the only logical form which is generable from the surface structure of this sentence which satisfies both the Condition on Proper Binding and the Subjacency Condition, is (3.7):

$$(3.7) \quad [{}_S[\text{someone}]_\beta [{}_S \beta \text{ hissed that } [{}_S[\text{every painting in the museum}]_\alpha [{}_S \text{ Smith liked } \alpha]]]]$$

In order for 'every' to be construed as having wider scope than 'some', it would be necessary to be able to associate the surface structure of (3.6)a with a logical form in which 'every painting' is adjoined to the S dominating 'some'. But this structure, illustrated in (3.8), is ill-

$$(3.8) \quad *[_S[\text{every painting in the museum}]_\alpha [{}_S[\text{someone}]_\beta [{}_S \beta \text{ hissed that } [{}_S \text{ Smith liked } \alpha]]]]$$

formed, since the variable ' α ' is not subjacent to 'every painting in the

museum'. Thus, an explanation of the fact that matrix-clause quantifiers generally take wider scope than complement-clause quantifiers follows from quantification being clause-bounded, which, in turn, follows from the Subjacency Condition.

Not only is a quantifier in an \bar{S} -complement construed as having scope narrower than any quantifiers in the matrix clause, it is also generally construed as having scope narrower than negation in the matrix. Consider in this regard sentence (3.9):

(3.9) $[_{S_i} \text{John didn't believe } [_{\bar{S}} \text{that } [_{S_j} [_{NP} \text{everyone}] \text{had left}]]]$

(3.9) is unambiguous; its only reading is one in which it is held that it is not the case that John believes that everyone had left. This reading is captured by the logical form (3.10):

(3.10) $[_{S} [\text{not}] [_{S_i} \text{John believes that } [_{S} \text{everyone}]_{\alpha} [_{S_j}^{\alpha} \text{had left}]]]]]$

(3.10) is derived (under the assumption that the negation in (3.9) is sentential negation, which is represented in logical form by adjoining the negative particle to S), by QR adjoining the quantified noun phrase 'everyone' to S_j , of which it is an immediate constituent. This is the only logical form which is generable from (3.9) which satisfies the Subjacency Condition; to adjoin 'everyone' elsewhere would result in a structure violating this condition.

In this section, then, we have seen that the nature of the logical

form which can be associated with full \bar{S} -complements is explained by the Subjacency Condition,⁴ which only permits, as well-formed, logical forms in which quantifiers take scope over the clauses of which they are immediate constituents (in surface structure). That is, quantification is clause-bounded, in the unmarked case. Given this property of quantification in these constructions, it follows immediately that any quantifiers in an embedded complement clause have scope narrower than any logical operators (viz., quantifiers or negation), which appear in the matrix clause.

3.3 The Marked Case. As we have seen, a logical form in which a quantified phrase, embedded in a complement clause in surface structure, has narrower scope than the matrix predicate, represents the unmarked case in matrix-complement constructions. That is, its existence is determinable (by the principles of core grammar), solely from the structure of these constructions, independently of any idiosyncratic properties of particular sentences. This logical form is always possible, occurring as a general property of \bar{S} -complements containing embedded quantifiers. There do exist cases, though, which contrast with the unambiguity of sentences like those of (3.1), and display an ambiguity. In addition to an opaque interpretation, they also have a "transparent" interpretation:⁵

- (3.11)a John believed that someone was at the door
- b Harry wanted us to invite too many people
to the party

c John realized that a picture had been stolen

Consider, as an example, (3.11)a. On the unmarked reading, (3.11)a asserts that John believed that there was someone (or other) at the door, although he may not have believed this of any person in particular. On the other, transparent, reading, it is being asserted of some person, that John believed that he was at the door. A similar ambiguity arises in the other cases in (3.11). The significant aspect of the transparent reading in these cases is that its occurrence is highly idiosyncratic, in comparison to the opaque (narrow scope) reading, which is always available in sentences of this construction. Thus, it has been argued in Quine (1955) that the transparent, or relational, reading of sentences like (3.11) is available where what Quine calls "exportation" is possible, i.e., where a variable can be, so to speak, moved into a referentially transparent position. Thus, the logical representation of (3.12) on the transparent reading is (3.13), where the variable has been exported. According to

(3.12) Ralph believes that someone is a spy

(3.13) $(\exists x)(\text{Ralph believes } \underline{z}(\underline{z} \text{ is a spy}) \text{ of } \underline{x})$

Quine, (3.13) is "our new way of saying that there is someone whom John believes to be a spy." (p. 187). It has been pointed out in Kaplan (1969) that the condition under which a name is a candidate for exportation, in Quine's sense, is when it is sufficiently "vivid". Kaplan

characterizes the notion of a vivid name as follows:

The notion of a vivid name is intended to go to purely internal aspects of individuation. Consider typical cases in which we would be likely to say that Ralph knows x or is acquainted with x. Then look only at the conglomeration of images, names, and partial descriptions which Ralph employs to bring x before his mind. Such a conglomeration, when suitably arranged and regimented, is what I call a vivid name.

(p. 229)

A name may be exported, then, just in case it is vivid. The possibility of transparency, therefore, is dependent upon the nature of the cognitive representations which a speaker has of the entity whom the name is of, for a particular instance of use of that name. These sort of factors, though, cannot be captured in a core grammar; the notion of vividness, which governs the possibility of transparency, is fundamentally beyond the expressive power of the theory of core grammar.⁶

What these observations show is that in matrix-complement construction containing a quantified noun phrase as a constituent of the complement to an opaque predicate, it is always possible to have a referentially opaque reading, but only sometimes a transparent reading. As in the other marked cases discussed above, this empirical distinction correlates with a formal distinction: it is only a structure representing the universally available opaque reading which can be directly generated by core grammar.⁷ The theory of core grammar therefore explains the properties of the unmarked case, while an account of the marked transparent reading lies beyond its scope. This is a welcome result, since it shows that Universal

Grammar distinguishes those properties of quantification which are universal (i.e., determinable solely as a function of sentential structure), and those which are idiosyncratic- in this case, to particular utterances of sentences.

3.4 Relative-Clause Constructions. When we began our discussion of restrictive relative clauses in Chapter Two, we noted that this construction has a dual personality. On the one hand, relative clauses have properties in common with other complex nominal constructions, like PP-complements. On the other hand, since they contain embedded sentential complements, they also have properties in common with other sentences containing embedded clauses, such as matrix-complement constructions of the type just discussed. It is on this latter side of relative clauses that we wish to focus our attention in this section.

It has been noted in the literature that the interpretation characteristically associated with relative clauses like those in (3.14) is where the head quantifier is construed

- (3.14)a Everyone who bought an Edsel got a lemon
- b John defeated some politician who runs in every election

as having scope wider than the quantifier embedded in the relative clause. The generality of this property of the logical forms associated with relative clauses is pointed out by Rodman (1976), who observes that:

In a relative clause, the element that is
relativized always has wider scope than
any other element in that relative clause

(p. 168)

This property of the interpretation of relative clauses is highlighted by comparing (3.14)a, for example, to (3.15):

(3.15) Everyone bought an Edsel, which is a lemon

(3.15) is ambiguous. On one reading, it asserts that for each person who bought an Edsel, the car he bought is a lemon, while on the other reading, it asserts that there is a particular Edsel, which everyone bought, and which is a lemon. In contrast, (3.14)a is unambiguous. It only has an interpretation parallel to the former reading of (3.15), i.e., a reading where 'every' is construed as having scope wider than 'a'.

What we wish to show in this section is that the generalization above follows as a consequence of the fact that the only logical form which can be generated from the surface structure of relative clauses, and which satisfies the well-formedness conditions on logical forms, is, in our terms, naturally linked, with the "head" quantifier binding a variable in the main predicate. Thus, the only logical form which may be associated with (3.14)a is (3.16):

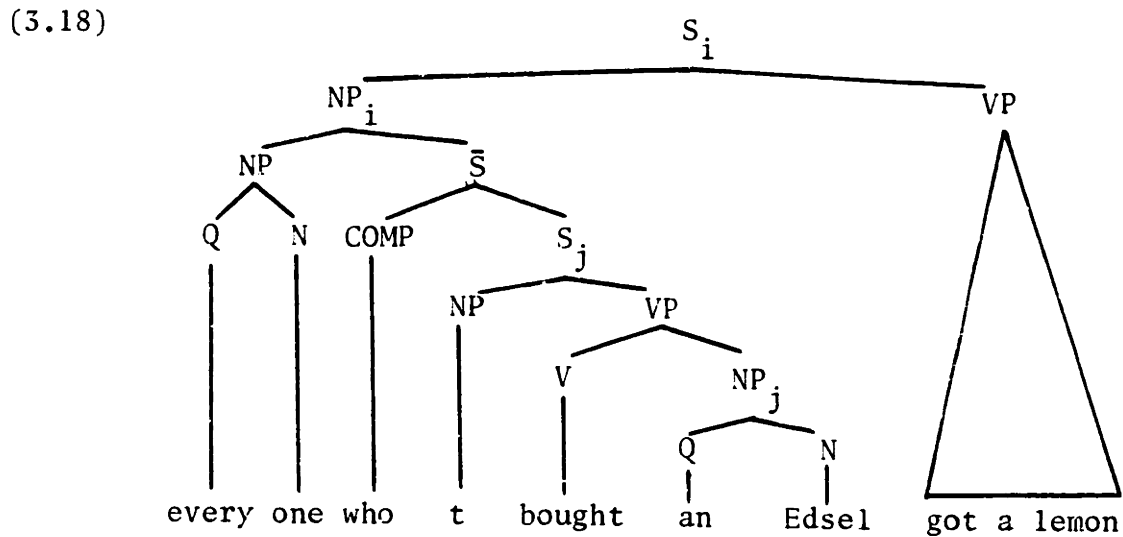
(3.16) $[_S[\text{everyone who } [_S[\text{an Edsel}]_\beta [_S^t \text{bought } \beta]]]_\alpha$
 $[_S^\alpha \text{ got a lemon}]$

which is ultimately converted into a structure like (3.17) (on the assumption that the wh-word in relative clauses is realized as a conjunction in logical form):⁸

$$(3.17) \quad [_S \forall \alpha [_S [_S \alpha \text{ is a person}] \& [_S \exists \beta [_S [_S \beta \text{ is an Edsel}] \& [_S \alpha \text{ bought } \beta]]] \rightarrow [\alpha \text{ got a lemon}]]]$$

The pertinent feature of (3.17) is that it contains a quantifier, here 'a', whose scope is limited to the embedded relative clause, as well as a quantifier, 'every', whose scope is the entire complex sentence.⁸

(3.17) is derived, from the surface structure (3.18), by



QR adjoining NP_j to S_j and NP_i to S_i . An example of this derivation is given in (3.19):

$$\begin{aligned}
 (3.19) \quad & [S_i [NP_i [NP [Q_{\text{every}}] \text{one}] [\bar{S}_{\text{who}} [S_j \text{t bought } [NP_j [Q_{\text{an}}] \text{Edsel}]]]] \\
 & \quad \text{got a lemon}] \rightarrow \\
 & [S [\text{everyone } [\bar{S}_{\text{who}} [S_j \text{t bought } [NP_j [Q_{\text{an}}] \text{Edsel}]]]]]_{\alpha} \\
 & \quad [S_i^{\alpha} \text{got a lemon}] \rightarrow \\
 & [S [\text{everyone } [\bar{S}_{\text{who}} [S [\text{an Edsel}]_{\beta} [S_j \text{t bought } \beta]]]]]_{\alpha} \\
 & \quad [S_i^{\alpha} \text{got a lemon}]
 \end{aligned}$$

The structure generated by the derivation in (3.19) [= (3.16)] is a well-formed logical form, since both of the variables ' α ' and ' β ' are properly bound by, and subjacent to, the quantified noun phrases which bind them. Indeed, (3.16) is the only logical form which can be generated from the surface structure in (3.18), which meets the conditions on well-formed representations at Logical Form. To see this, note that the only other structure which may be derived from (3.18) by QR (which satisfies the Condition on Proper Binding) is (3.20):

$$\begin{aligned}
 (3.20) \quad & * [S [\text{an Edsel}]_{\beta} [S_k [\text{everyone } [\bar{S}_{\text{who}} [S_j \text{t bought } \beta]]]]]_{\alpha} \\
 & \quad [S_i^{\alpha} \text{got a lemon}]]
 \end{aligned}$$

(3.20) is derived by adjoining NP_j in (3.18), 'an Edsel', to S_k , which arises from the adjunction of NP_i to S_i . (3.20), as compared to (3.16), is ill-formed. This is because there are two bounding nodes, S_k and S_j , intervening between 'an Edsel' and the variable, ' β ', which it binds. (3.20), therefore, is a violation of the Subjacency Condition, and is thus ill-formed. Thus, (3.16) is the only logical form which may be generated from the surface structure of relative clauses, and as such, it represents the unmarked interpretation of relative clause constructions.⁹

The significance of this result is that it provides us with an explanation of Rodman's observation, since this observation now follows as a consequence of the theory. That is, in a relative clause, the embedded quantifier is construed as taking narrower scope than the head quantifier, because the only well-formed logical form generable from the surface structure of relative clauses, in accordance with the principles of core grammar, is naturally linked, as in (3.16). Other logical forms, such as (3.20), where the embedded quantifier takes wider scope, are ill-formed, since they violate the Subjacency Condition.

In light of this explanation of the nature of the logical forms associated with relative clauses, which is based on the Subjacency Condition, it is of interest to consider the following commentary by Chomsky (1975b):

The quantificational property that Rodman noted is a special case of a much more general principle, and the impossibility of relativization within a relative, I believe, also falls under a far more general, but quite different principle, namely, that all transformational rules are restricted to adjacent cyclic nodes [i.e., by the Subjacency Condition - RCM]

(p. 105)

Chomsky is wrong here, but for the right reasons. Under the analysis presented here, both the impossibility of relativization within a relative and the quantificational property noted by Rodman fall under the same general principle, but this principle is just that which Chomsky has argued explains the impossibility of relativization, viz., the Subjacency Condition. That

is, it is just those principles which explain the impossibility of extraction from relative clauses, which also explain why the logical form associated with restrictive relative clauses, like those in (3.14), have the property described by Rodman's observation. That this should be the case follows from the theory of core grammar we are assuming here, in which the Subjacency Condition involves S, rather than \bar{S} .

Of the constructions that have been examined, relative clauses are the only one, aside from PP-complement constructions, which are associated with linked logical forms.¹⁰ That is, in the logical forms associated with these constructions, only one of the quantifiers binds a variable in the main predicate; compare (3.16) to (3.21), which is the logical form associated with the sentence 'Some people in every city voted for Debs':

$$(3.16) \quad [{}_S[\text{everyone who } [{}_S[\text{an Edsel}]_\beta [{}_S^t \text{bought } \beta]]]_\alpha \\ [{}_S \alpha \text{ got a lemon}]]$$

$$(3.21) \quad [{}_S[\text{every city}]_\alpha [{}_S[\text{some people in } \alpha]_\beta [{}_S \beta \text{ voted for Debs}]]]$$

The primary feature which these logical forms have in common is that in both cases, 'every' has wider scope, since it c-commands 'some'. Besides this common feature, there are other points of comparison between them:

A.) In a relative clause, the head quantifier in surface structure ('every' - cf. ex. (3.18)) has wider scope in logical form than the quantifier 'a', which is embedded in the complement in surface structure. In

PP-complements the situation is reversed. Here, as (3.21) shows, the head quantifier in surface structure, 'some', has narrower scope in logical form than the quantifier 'every', which is embedded in the complement in surface structure. Thus, relative clauses are associated with naturally linked logical forms, and PP-complements with inversely linked logical forms, vis-a-vis their surface structures.

B.) In the logical form associated with relative clauses, it is the quantifier which has widest scope which binds a variable in the main predicate, but in PP-complements, it is the quantifier with narrowest scope which binds a variable in the main predicate. Thus, in (3.16), 'every' has wider scope, and binds a variable, ' α ' in the main predicate, ' α got a lemon'. In (3.21), on the other hand, 'some', which has scope narrower than 'every', binds the variable ' β ' in the main predicate, ' β voted for Debs'.

C.) In the logical forms associated with relative clauses and PP-complements, the quantifier which is embedded in the complement in surface structure ('a' in (3.16), 'every' in (3.21)) does not bind a variable in the main predicate in logical form. Rather, it is the head quantifier in surface structure which, in both cases, binds a variable in the main predicate.

What is of great interest in making this comparison of the logical forms represented by (3.16) and (3.21) is that they exhaust, by enumeration, the possibilities of linked structures for logical forms. That is,

they are the only linked structures which satisfy the general well-formedness conditions (e.g., the Conditions on Proper Binding and Quantifier Binding) on structures generated by QR from surface structures containing noun complements constructions. Thus, the theory of grammar makes a very strong empirical claim in this regard: it predicts universally that if a natural language has linked logical forms, then they will be of the type illustrated by (3.16) and (3.21), and have the properties just described. This observation is not limited solely to those logical forms which represent the unmarked interpretation of a particular construction; rather, it is an explanation of the range of possible linked structures regardless of whether they represent marked or unmarked interpretations. Thus, in Chapter Four, we will see that the logical structure which represents the marked interpretations of PP-complement constructions is essentially the same structure as that representing the unmarked interpretation of relative clauses; both the marked and unmarked cases are represented by naturally linked logical forms, with properties (A) - (C).¹¹ Given the principles of core grammar, therefore, it is possible to explain two deep properties of natural language quantifiers: What are possible logical forms for sentences containing quantified phrases, and, of those possible logical forms, which constitute the marked and unmarked cases. We return to these matters briefly in Chapter Four.

3.5 Subjectless Complement Constructions. In the discussion above of matrix-complement constructions, we were concerned with the properties of quantifiers which occurred in complex sentences with full \bar{S} -complements -- i.e., 'that' and 'for' clauses, indirect question complements, etc. What we have not yet examined are constructions in which the complement clause does not contain an overt subject noun phrase; e.g., raising, equi and control ('promise' - 'persuade') constructions. It is these latter constructions which are the topic of this section. In particular, our interest is centered around explaining the contrast in the range of possible interpretations of the sentences in (3.22) - (3.24):

- (3.22)a Every musician believes that Bird lives
- b Someone is anxious for Monk to play Epistrophy

- (3.23)a Everyone seems to like Cecil's playing
- b Some politician is likely to address John's constituency
- c Many people were thought to have sold IBM shares

- (3.24)a Every musician wants to play like Bird
- b Some senator promised to address John's constituency

Both of the sentences in (3.22) are unambiguous. In both cases the quantifier which appears in the matrix subject can only be construed as having scope over the entire complex sentence, i.e., as having wide scope over the

matrix predicate. The sentences in (3.23), by way of comparison, are ambiguous. In these examples the quantifier may be understood as having either wider or narrower scope than the matrix predicate. Thus (3.23)b may be taken as asserting either (i) that there is a politician, e.g., Rockefeller, who is likely to address John's constituency, or (ii) that it is likely that there is some politician (or other) who will address John's constituency. In contrast to the sentences in (3.23), those in (3.24), which also contain an overtly subjectless complement clause, are unambiguous. They lack a narrow scope reading parallel to that described by (ii) for (3.23)b. Their interpretation is parallel to that of the sentences in (3.22), i.e., the quantifier in the matrix clause can only be understood as having wide scope over the matrix predicate.

What the examples in (3.22) - (3.24) indicate is that there is a difference in the range of possible interpretations available in raising constructions - i.e., sentences containing infinitival complements to predicates like 'be certain', 'seems', 'be likely', 'be believed', etc. - than in full \bar{S} -complements constructions (cf. (3.22)), or in equi and control constructions (cf. (3.24)). In this section, we will see that the explanation of these differences follows from the general well-formedness conditions on representations at the level of Logical Form; in particular, from the Condition on Proper Binding. That is, the reason that sentences like (3.23), containing raising predicates, are ambiguous is that they can be associated with two distinct logical forms, each of which satisfies the Condition on Proper Binding. This is in contrast, as we shall see, to sentences containing non-raising predicates, like those in (3.22) and

(3.24), which can only be associated with a single well-formed logical form.

* * * * *

We begin by examining the range of logical forms which may be associated with full \bar{S} -complement constructions, like those in (3.22). For example, consider (3.25), which is the surface structure of (3.22)a:

(3.25) $[_S[_{NP}\text{Every musician}] \text{believes } [_{\bar{S}}\text{that } [_S\text{Bird lives}]]]$

The only well-formed logical form which can be generated from this structure is (3.26), in which the quantified noun phrase 'every musician' is adjoined to the matrix S:

(3.26) $[_S[\text{every musician}]_{\alpha} [_S^{\alpha} \text{believes } [_{\bar{S}}\text{that } [_S\text{Bird lives}]]]]]$

(3.26) is well-formed since the variable ' α ' is properly bound and sub-jacent to the noun phrase which binds it. Since QR applies freely, (3.26) is not the only structure derivable from (3.25) by QR; it can also adjoin the quantified phrase to the complements as well, deriving (3.27):

(3.27) $*[_S^{\alpha} \text{believes } [_{\bar{S}}\text{that } [_S[\text{every musician}]_{\alpha} [_S\text{Bird lives}]]]]]$

In (3.27), the quantifier 'every' has scope narrower than the matrix

predicate 'believe', in contrast to (3.26), where it has scope wider than 'believe'. (3.27) is not a well-formed structure; it violates the Condition on Proper Binding, since it contains a variable, ' α ', which is not c-commanded by the phrase which binds it. Therefore, sentences like those in (3.22) are unambiguous because it is possible to associate them with only one well-formed logical form, viz., (3.26).

Compare this to the situation with raising structures, such as those illustrated by the sentences in (3.23). The surface structure of these constructions is generated by NP-movement raising the underlying subject of the complement clause into the sentence-initial noun phrase position. This results in a surface structure like that in (3.29), which is derived from the underlying structure in (3.28) by NP-movement.¹²

(3.28) $[_S[_{NP}e]$ is likely $[_{\bar{S}}\text{for } [_S[_{NP}\text{some politician}]$
to address John's constituency]]]

(3.29) $[_S[_{NP}\text{some politician}]_t]$ is likely $[_{\bar{S}}[_S t]$ to address
John's constituency]]]

In the surface structure (3.29) the noun phrase 'some politician' (properly) binds the trace in the complement subject position. Thus, just as it is possible to derive, via QR, two logical forms from (3.25), it is also possible to derive two logical forms from (3.29); one by adjoining the quantified noun phrase 'some politician' to the matrix S, the other by adjoining it to the complement S:

(3.30) $[_S[\text{some politician}]_{\alpha} [_S\alpha \text{ is likely } [_{\bar{S}}[_S t \text{ to address}$
 John's constituency]]]]

(3.31) $[_S\alpha \text{ is likely } [_{\bar{S}}[_S[\text{some politician}]_{\alpha} [_S t \text{ to address}$
 John's constituency]]]]

(N.B. In (3.30) and (3.31) ' α ' and ' t ' represent occurrences of the same variable, since they both arise from movement of the same noun phrase; hence they are both bound by this phrase.) The structure in (3.30) is parallel to (3.26), and is also well-formed, since both ' α ' and ' t ' are properly bound. In this logical form, the quantifier 'some' has scope wider than the matrix predicate 'likely'; it corresponds to the (i) reading of this sentence as described above. In (3.31), on the other hand, the quantifier has scope narrower than 'likely'; this logical form corresponds to the (ii) reading above. Ostensibly, (3.31) is an ill-formed structure, just as (3.27) is: it contains a variable, ' α ', which apparently is not properly bound. But, if this is not a logical form of (3.29), why isn't this sentence unambiguous, just as (3.25), containing 'believe', is?

The answer to this question lies in a somewhat closer look at the properties of predicates such as 'be likely', 'be certain', etc. It has been pointed out in the literature (e.g., by Freidin (1977) and Chomsky and Lasnik (1977)), that, of the predicates which take \bar{S} -complements, there is a sub-set which are construed essentially as "sentence operators". These predicates are, on the whole, copulative verbs, and are character-

ized by the fact that 'it' may appear as their subjects, as, for example, in (3.32):

- (3.32)a It is necessary for students to learn Koko
by heart
- b It is possible that the Benedetti tapes
will be found
- c It is true that Hayes was faster than Owens
- d It is likely that some politician will
address John's constituency
- e It is certain that Mr. Smith swindled
our computer

These examples contrast with those in (3.33), where 'it' may not occur in the matrix subject:¹³

- (3.33)a *It hoped for students to learn Koko by
heart
- b *It believes that the Benedetti tapes
will be found
- c *It wants to play like Bird
- d *It promised to use his influence

The significance of this difference becomes apparent once we recall the Predication Condition, which was discussed in Chapter One, and is repeated here:

Predication Condition

Every argument place of a predicate must be either a referring expression or a properly bound variable

As in the case of the other conditions being assumed here, the Predication Condition is a condition on well-formed representations at the level of Logical Form. Notice that it follows from this condition that since 'it' is neither a referring expression nor a properly bound variable,¹⁴ it may only occur in an NP position which is not an argument place of a predicate. Therefore, the initial noun phrase position in sentences like (3.32) is not an argument position of the matrix predicate, though in sentences like those in (3.33), where 'it' is impossible in the initial NP position, it is. In particular, this means, as examples (3.32)d and (3.32)e show, that the initial NP position in sentences containing raising predicates like 'be certain' or 'be likely' is not an argument position.

Return now to the status of structures (3.27) and (3.31), vis-a-vis the Condition on Proper Binding:

Condition on Proper Binding

Every variable in an argument position of a predicate must be properly bound

(3.27) $*[S_{\alpha} \text{ believes } [S_{\text{that}} [S_{\text{every musician}}]_{\alpha} [S_{\text{Bird lives}}]]]$

(3.31) $[S_{\text{i}} \alpha \text{ is likely } [S_{\text{some politician}}]_{\alpha} [S_{\text{j}} \alpha \text{ to address John's constituency}]]]$

(This condition, as was pointed out in Chapter One, is a corollary of the Predication Condition. Note that the variable 't' in (3.31) has been changed to ' α ' in this reproduction. cf. the comments on p. 192.) In the case of (3.27), as (3.33)b shows, the subject of 'believe' is an argument position. (3.27), therefore, violates the Condition on Proper Binding, since it contains a variable which is not c-commanded by the phrase which binds it. In (3.31), on the other hand, the initial noun phrase is not an argument position, and therefore variables occurring in it are not subject to the Condition on Proper Binding. The only variable which occurs in an argument position in (3.31) is the variable in S_j (e.g., *'It addressed John's constituency'). This variable, though, is properly bound, since it is c-commanded by the noun phrase, 'some politician' which binds it. Since (3.31) satisfies the Condition on Proper Binding (all variables in argument positions are properly bound), it is a well-formed logical form.

What this shows, then, is that given the Condition on Proper Binding, sentences containing raising predicates like those in (3.23), should be ambiguous, as opposed to sentences with full \bar{S} -complements, as in (3.22). This is because sentences of the former type can be associated with two well-formed logical forms; one in which the quantified phrase which occurs in the initial NP position in surface structure has wider scope than the matrix predicate (viz., (3.30)), and one in which it has narrower scope, (viz., (3.31)). Sentences like those in (3.22), on the other hand, are unambiguous, having only a reading in which the matrix quantifier is construed as having wide scope, since it is

possible to generate from its surface structure only the logical form (3.26). A logical form in which this quantifier has narrower scope than the matrix predicate is not generable; (3.27), as opposed to (3.31), violates the Condition on Proper Binding.

* * * * *

Consider now the equi and control constructions illustrated by the sentences in (3.24). In certain respects, these constructions are identical to the raising structures in (3.23); in all of these cases the embedded subject is a (properly) bound variable. They differ, though, in that while sentences like (3.23) are ambiguous, the equi and control constructions in (3.24) are not. They only have a reading in which the quantifier is understood as having scope wider than the matrix predicate, as in full \bar{S} -complement constructions. Why is it, then, that these constructions can only be associated with a logical form in which the subject quantifier takes wider scope than the matrix predicate?

To answer this question, let us first consider "equi" constructions, like (3.24)a. In discussing these sentences, we will be following

(3.24)a Every musician wants to play like Bird

suggestions in Chomsky (1974) and Chomsky and Lasnik (1977) that equi is a deletion of a bound reflexive anaphor in the complement subject position of predicates like 'want', 'be anxious', etc. As is argued in the latter

reference this deletion is independent of the operations of sentence grammar, per se; Surface Structure, and hence Logical Form, may therefore contain elements which are not phonologically realized. Under these assumptions, the surface structure of (3.24)a is (3.34).¹⁵

$$(3.34) \quad [{}_S[{}_{NP}\text{Every musician}]_{\alpha} \text{ wants } [{}_{\bar{S}}(\text{for})[{}_S[{}_{NP}\alpha\text{'s self} \\ \text{to play like Bird}]]]]$$

(3.34) is parallel to the surface structure (3.29), containing 'likely', in that the complement subject in both cases is a bound variable; in (3.29) it is a trace, in (3.34) a bound reflexive anaphor. As in the case of the surface structures (3.25) and (3.29), it is possible to derive two structures from (3.34) by QR: (3.36), which results from adjunction of the phrase 'every musician' to the matrix S, and (3.37), which results from adjunction to the complement S:

$$(3.35) \quad [{}_S[\text{every musician}]_{\alpha} [{}_S{}_i \alpha \text{ wants } [{}_{\bar{S}}[{}_S{}_j [{}_{NP}\alpha\text{'s self} \\ \text{to play like Bird}]]]]]$$

$$(3.36) \quad *[_S{}_i \alpha \text{ wants } [{}_{\bar{S}}[{}_S[\text{every musician}]_{\alpha} [{}_S{}_j [{}_{NP}\alpha\text{'s self} \\ \text{to play like Bird}]]]]]$$

(3.35) is a well-formed logical form; both of the variables are properly bound by the phrase 'every musician', thereby satisfying the Condition on Proper Binding. The structure in (3.36), on the other hand, violates

this condition, since the variable in the subject position of 'want', which is an argument position, (c.g., *'It wants for every musician to play like Bird'), is not c-commanded by 'every musician' which binds it. (3.36) is therefore ill-formed. Thus, the only well-formed logical form which can be generated from the surface structure of equi constructions which contain quantified noun phrases in the matrix object position is one in which the quantifier has scope wider than the matrix predicate. This fact explains the unambiguous nature of sentences of this construction.¹⁶

The situation in control constructions, illustrated in (3.37), is parallel to that in equi constructions. Thus, it has been argued in

- (3.37)a Some politician promised to address John's constituency
- b Jones persuaded some politician to address John's constituency

Chomsky (1973) and Chomsky and Lasnik (1977), among other places,¹⁷ that the subject of the complement clause in this construction must be a variable, usually represented by PRO, which is controlled (i.e., bound) by either the matrix subject or the matrix object, depending upon the predicate: 'promise' requires subject control, 'persuade' object control. Thus, the surface structures of (3.37)a and (3.37)b are (3.38) and (3.39), respectively:

- (3.38) $[_S[_{NP}\text{Some politician}]_\alpha \text{ promised } [_{\bar{S}}[_S[_{NP}^{PRO}_\alpha] \text{ to address John's constituency}]]]$

- (3.39) $[_S \text{Jones persuaded } [_{NP} \text{some politician}]_{\alpha} [_{\bar{S}} [_S [_{NP} \text{PRO}_{\alpha}]$
to address John's constituency]]]

As in (3.29) and (3.34), it is possible to derive two structures from (3.38) by QR:

- (3.40) $[_S [\text{some politician}]_{\alpha} [_S \alpha \text{ promised } [_{\bar{S}} [_S [_{NP} \text{PRO}_{\alpha}]$
address John's constituency]]]]]

- (3.41) $*[_S \alpha \text{ promised } [_{\bar{S}} [_S [\text{some politician}]_{\alpha} [_S [_{NP} \text{PRO}_{\alpha}]$
address John's constituency]]]]]

(3.40) is a well-formed logical form, since it satisfies the Condition on Proper Binding. (3.41), on the other hand, does not satisfy this condition. This is because the subject of 'promise' is an argument position; e.g., **'It promised to address John's constituency'*. If this subject NP contains a variable, then it must be properly bound. But in (3.41), the variable ' α ' is not properly bound, since it is not c-commanded by the phrase 'some politician', which binds it. In this respect, (3.41) is like (3.31) and (3.36), and, therefore, the explanation of the unambiguity of sentences like (3.37)a is the same as that for the sentences in (3.22) and (3.24)a: in the only well-formed logical form which may be generated from its surface structure, the quantifier has wider scope than the matrix predicate.

A sentence like (3.37)b with 'persuade' (whose surface structure

is (3.39)), is parallel to raising, equi and 'promise' constructions in that the subject of its complement is a bound variable in surface structure. Where it differs is that the variable is bound by the matrix object in this construction, and not by the subject, as in the others. Given this, once we notice that the object of 'persuade' is an argument position (*'John persuaded it to address John's constituency'), we can see that the explanation of its unambiguity also resides in the Condition on Proper Binding. Thus, as in the other cases, it is possible to derive two structures from the surface structure (3.39):

$$(3.42) \quad [_S[\text{some politician}]_{\alpha} [_S[\text{Jones persuaded } \alpha [_{\bar{S}}[_S[_{NP}^{PRO}_{\alpha}] \text{ to address John's constituency}]]]]]$$

$$(3.43) \quad *[_S[\text{John persuaded } \alpha [_{\bar{S}}[_S[\text{some politician}]_{\alpha} [_S[_{NP}^{PRO}_{\alpha}] \text{ to address John's constituency}]]]]]$$

(3.42) is well-formed; both variables are properly bound. (3.43) violates the Condition on Proper Binding, since the object position of 'persuade' contains a variable which is not properly bound. Thus, in control constructions with object control, as in those with subject control, there is only one logical form which may be generated from the surface structure, which explains why the quantifier in the matrix object in surface structure is understood as having scope wider than the matrix predicate 'persuade'.

Thus, the fundamental difference which distinguishes equi and

control constructions, on the one hand, from raising constructions on the other, is that in the latter the subject of the matrix predicate is not an argument position. It thus follows, from the Condition on Proper Binding, that sentences of the former construction are unambiguous, as opposed to sentences of the latter construction, which are ambiguous.

A difference in the range of possible interpretations in these constructions is also evident in examples containing more than one quantifier. Thus, compare the example in (3.44) with those in (3.45):

(3.44) Some politician is likely to address every
rally in John's district

(3.45)a Every musician wants to play in an orchestra

b Some politician promised to address every
rally in John's district

c John persuaded some politician to address
every rally in John's district

The examples in (3.45) are all unambiguous; in each case the matrix quantifier is construed as having scope wider than the quantifier in the complement clause. (3.44), on the other hand, is three-ways ambiguous. It may be understood as asserting either (i) that there is a politician, e.g., Rockefeller, who will address all of the rallies in John's district; (ii) that it is likely that there is some politician (or other) who will address all of the rallies; or (iii) that it is likely that for each of the rallies, there is some politician who will address it (i.e., there may be a different politician for each rally).

The unambiguity of the examples in (3.45) follows immediately from the Condition on Proper Binding and the Subjacency Condition. Thus, it is only possible to generate a single logical form from their surface structures. For example, from the surface structure of (3.45)a, which is (3.46), it is only possible to generate the logical form (3.47):

(3.46) $[_S[_{NP}\text{Every musician}]_\alpha \text{ wants } [_S[_S^\alpha\text{'s self to play}$
 $\text{in an orchestra}]]]]]$

(3.47) $[_S[\text{every musician}]_\alpha [_S^\alpha \text{ wants } [_S[_S[\text{an orchestra}]_\beta$
 $[_S^\alpha\text{'s self to play in } \beta]]]]]$

(3.47) is derived by adjoining the noun phrase 'every musician' to the matrix S, and 'an orchestra' to the complement S. This is the only logical form generable from (3.46) because to adjoin the matrix quantified noun phrase to the complement S would violate the Condition on Proper Binding (cf. e.g. (3.36)), while adjoining the quantified phrase in the complement to the matrix S would violate the Subjacency Condition (cf. p. 172 ff.). The same situation arises in control constructions as does in equi constructions. Thus, from the surface structures of (3.45)b and (3.45)c (= (3.48)a and (3.48)b), it is only possible to generate (3.49)a and (3.49)b, respectively; any other structures which could be derived by QR would violate either the Condition on Proper

(3.48)a $[_S[_{NP}\text{some politician}]_\alpha \text{ promised } [_{\bar{S}}[_S^{\text{PRO}}_\alpha \text{ to address } [_{NP}\text{every rally in John's district}]]]]]$

b $[_S\text{John persuaded } [_{NP}\text{some politician}]_\alpha [_{\bar{S}}^{\text{PRO}}_\alpha \text{ to address } [_{NP}\text{every rally in John's district}]]]]]$

(3.49)a $[_S[\text{some politician}]_\alpha [_S^\alpha \text{ promised } [_{\bar{S}}[_S[\text{every rally in John's district}]_\beta [_S^{\text{PRO}}_\alpha \text{ to address } \beta]]]]]]]$

b $[_S[\text{some politician}]_\alpha [_S\text{John persuaded } \alpha[_{\bar{S}}[_S[\text{every rally in John's district}]_\beta [_S^{\text{PRO}}_\alpha \text{ to address } \beta]]]]]]]$

Binding or the Subjacency Condition. In all of the sentences in (3.45), then, the reason that they only have a reading in which the matrix quantifier has wider scope in logical form than the complement quantifier is that it is only possible to generate a logical form from their surface structures with these scope relations. Others would violate the well-formedness conditions on logical forms.

The difference, recall, between raising constructions, like (3.44), and the equi and control constructions illustrated in (3.45), is that in the former case, adjunction by QR of a quantified noun phrase in the matrix clause to the complement S does not violate the Condition on Proper Binding. This fact allows for the derivation of three distinct, well-formed logical forms from the surface structure of (3.44), which is (3.50). One, (3.51)a, is generated in the same manner as (3.47), (3.49)a,

(3.50) $[_S[_{NP}\text{Some politician}]_t \text{ is likely } [_{\bar{S}}[_S t \text{ to address } [_{NP}\text{every rally in John's district}]]]]]$

and (3.49)b; i.e., by adjunction of the quantified phrase in the matrix

- (3.51)a $[_S[\text{some politician}]_\alpha [_S^\alpha \text{ is likely } [_{\bar{S}}[_S[\text{every rally in John's district}]_\beta [_S^\alpha \text{ to address } \beta]]]]]$
- b $[_S(\text{it}) \text{ is likely } [_{\bar{S}}[_S[\text{some politician}]_\alpha [_S[\text{every rally in John's district}]_\beta [_S^\alpha \text{ to address } \beta]]]]]$
- c $[_S(\text{it}) \text{ is likely } [_{\bar{S}}[_S[\text{every rally in John's district}]_\beta [_S[\text{some politician}]_\alpha [_S^\alpha \text{ to address } \beta]]]]]$

clause to the matrix S , and the quantified phrase in the complement to the complement S . The other two, (3.51)b and (3.51)c are both generated by adjunction of both of these phrases to the complement S (cf. p. 191 ff.). Notice that all three of the structures in (3.51) are well-formed, since in each of them both the Condition on Proper Binding and the Subjacency Condition are satisfied. (3.51)a is the logical form representing the (i) reading of (3.44) described above, (3.51)b represents the (ii) reading, and (3.51)c the (iii) reading.

Thus, the difference in the range of interpretations of raising constructions like (3.44) from the equi and control constructions in (3.45) follows from the Condition on Proper Binding and the Subjacency Condition. In the former case it is possible to generate three distinct logical forms consistent with these conditions, but in the latter cases only a single well-formed logical form is generable.

Appendix: ON THE TENSED-S AND SPECIFIED SUBJECT CONDITIONS

Up to this point, we have been considering the following conditions on well-formed representations at the level of Logical Form: The Predication Condition, its corollary, The Condition on Proper Binding; The Condition on Quantifier Binding, and The Subjacency Condition. Aside from these conditions, there are two other conditions which we take to be well-formedness conditions on logical forms. These are the Tensed-S and Specified Subject Conditions, discussed in detail in Chomsky (1973), (1975a), (1976), (1977a), Kayne (1975) and Quicoli (1977a), (1977b). We will assume the formulation of these conditions in (A1):¹⁸

- (A1) A logical form with the structure

$$\dots X_i \dots [\bar{S} \dots V_i \dots] \dots X_i \dots$$

 is ill-formed,
 where: V_i is c-commanded by either
 tense or a subject.

As in the case of the Predication Condition, we take V_i here to be a variable, in the general sense of being either a trace, an anaphoric pronoun, a reciprocal or PRO. The effect of this condition can be seen by comparing the (a) and (b) examples in (A2) and (A3), all of which are derived by NP-movement:

- (A2)a $[_S[_{NP} \text{De Gaulle}]_t \text{ seemed } [_{\bar{S}}[_S t \text{ to be a great statesman}]]]$
 b $*[_S[_{NP} \text{De Gaulle}]_t \text{ seemed } [_{\bar{S}}[_S t \text{ is a great statesman}]]]$

- (A3)a $[_S[_{NP} \text{Kennedy}]_t \text{ seemed } [_{\bar{S}}[_S t \text{ to like De Gaulle}]]]$
 b $*[_S[_{NP} \text{Kennedy}]_t \text{ seemed } [_{\bar{S}}[_S \text{De Gaulle to like } t]]]$

In (A2)b, the complement clause contains tense, while in (A3)b it contains a subject. Since the complement clause in each case contains a variable, these structures violate the Tensed-S and Specified Subject Conditions. The examples in (A2)a and (A3)a, on the other hand, do not violate these conditions, since the complement clause in each does not contain either tense or a subject. They are, therefore, well-formed structures.

The effect of these conditions is quite parallel with regard to the principles of bound anaphora. Consider the examples in (A4):

- (A4)a $[_S \text{Kennedy expected } [_{\bar{S}}[_S \text{himself to be a great statesman}]]]$
 b $*[_S \text{Kennedy expected } [_{\bar{S}}[_S \text{himself was a great statesman}]]]$
 c $*[_S \text{Kennedy expected } [_{\bar{S}}[_S \text{Mrs. Gandhi to like himself}]]]$

The sentences in (A4) show that the Tensed-S and Specified Subject Conditions also restrict the possibilities of bound anaphora. They have the effect of allowing a reflexive pronoun in an infinitival complement clause to have an antecedent in the matrix clause only if the reflexive pronoun is the subject of the infinitive. Thus, in (A4)a, the reflexive pronoun is construed as bound by 'Kennedy'. In (A4)b and (A4)c, however, the complement clauses contain

tense and a subject, respectively. Hence these structures violate the Tensed-S and Specified Subject Conditions, and are therefore ill-formed.

In general, then, the effect of these conditions is to mandate that the subject of an infinitive is the only position open to anaphoric control by an element in another clause.

Since the Tensed-S and Specified Subject Conditions are conditions on well-formed logical forms, we would expect them to also effect the well-formedness of logical forms derived by QR. This issue, though, is actually moot, since the Subjacency Condition limits quantification to being clause bounded (in the unmarked case). Recall, that for a variable to be properly bound by a quantified phrase, it must be subjacent to that phrase, where subjacency in this case is determined with respect to S as the bounding node. The effect of the Subjacency Condition, thus, is to bound the scope of quantifiers to the clauses of which they are immediate constituents in surface structure. The Tensed-S and Specified Subject Conditions, however, are violated only when a variable is bound by an element which is a constituent of a higher clause than the clause of which the variable is an immediate constituent. The Subjacency Condition therefore guarantees that the logical forms which are generated by QR will always satisfy the Tensed-S and Specified Subject Conditions.

FOOTNOTES

Chapter Three

- 1 The formulation of the Subjacency Condition above is not quite correct, since it would have the unwanted effect of marking as ill-formed the logical form associated with such simple sentences as 'everyone loves someone', whose logical form (on one of its readings) is (i):

$$(i) \quad [S_i [\text{everyone}]_\alpha [S_j [\text{someone}]_\beta [S_k^\alpha \text{ loves } \beta]]]$$

(i) should be ill-formed, since there are two bounding nodes, S_j and S_k , intervening between the variable ' α ', and the phrase 'everyone' which binds it. This problem is avoided by reformulating the Subjacency Condition as in (ii):

(ii) Subjacency Condition

A logical form with the structure

$$\dots X_t \dots [\alpha \dots [\beta \dots [\gamma^t] \dots] \dots] \dots X_t \dots$$

(α, β bounding nodes), is ill-formed
 where (1) X_t immediately binds t
 (2) if $\alpha = \beta$, then α does not
 immediately dominate β

The effect of the additional clause (2) is that a chain of immediately

dominating S's, (or NP's) count as a single bounding node. Under this version of the Subjacency Condition, (i) is well-formed, since now ' α ' is subjacent to the noun phrase 'everyone'. This is because S_j immediately dominates S_k . Notice that this reformulation of the Subjacency Condition does not affect the explanation in the text of the nature of the logical forms which may be associated with matrix-complement constructions. In this case, there is still a violation of the Subjacency Condition, since, as (3.3) shows, S_i does not immediately dominate S_j , as there is an intervening \bar{S} node.

- 2 This issue is not insignificant in the case of wh-movement. Thus, it is only by a derivation in which wh-movement applies cyclically that it is possible to generate a structure which satisfies the Subjacency Condition. Consider the structures in (i):

- (i)a $*[\bar{S}_{\text{COMP}}^{\text{Which person}}]_t [S_i \text{ does Harry believe } [\bar{S}_{S_j \text{ John saw } t}]]]$
 b $[\bar{S}_{\text{COMP}}^{\text{Which person}}]_t [S_i \text{ does Harry believe } [\bar{S}^t_I [S_j \text{ John saw } t_j]]]]]$

(i)a is generated by a single operation of wh-movement, moving the wh-phrase from its underlying position as object of 'saw', to the matrix COMP position. This structure, though, violates the Subjacency Condition, since there are two bounding nodes, S_i and S_j , intervening between the

wh-phrase in COMP, and the trace which it binds. (i)b, on the other hand, does not violate this condition, on the assumption that the wh-phrase binds t_i , which appears in the embedded COMP, and which in turn binds t_j . Here, there is only a single bounding node, S_i , intervening between the wh-phrase and the trace, t_i , which it immediately binds; furthermore, there is only a single bounding node intervening between t_i and the trace, t_j , which it immediately binds. Since neither of the binding phrase-trace relations in (i)b violates the Subjacency Condition, (i)b is a well-formed structure, generated by wh-movement into COMP.

Thus, in the case of wh-movement, as opposed to QR, a cyclic derivation generates a structure which satisfies the Subjacency Condition. The fundamental reason for this difference is that QR is an adjunction to S, while wh-movement is a movement into COMP.

- 3 This property of natural language quantification was pointed out in Chomsky (1975b). For some of the implications of this property for the analysis of anaphora, see Chomsky (1976).
- 4 In the discussion of the Subjacency Condition up to this point, we have been assuming that S is the universal bounding node. There is further independent reason to hold that for rules mapping from Deep to Surface Structure, NP is also a bounding node. Chomsky (1977) has shown that by making this assumption a number of constraints which have been proposed in the literature can be subsumed under

the Subjacency Condition, e.g., The Complex Noun Phrase and Sentential Subject Constraints (Ross (1967)), The Subject Condition (Chomsky (1973)) and The NP Constraint (Bach and Horn (1976)). Thus, by assuming that NP and S are the bounding nodes for rules like NP-movement and wh-movement, which map from Deep to Surface Structure, it is possible to explain, on the basis of the Subjacency Condition, the impossibility of extraction from complex noun phrases, as, for example, in the cases in (i) and (ii):

- (i)a * $[\bar{S}[_{COMP} \text{Which city}]_t [_S \text{did} [_{NP} \text{some men in } t] \text{ vote for Debs}]]$
- b * $[\bar{S}[_{COMP} \text{Which author's}]_t [_S \text{did John like } [_{NP} t \text{ book}]]]$
- c * $[\bar{S}[_{COMP} \text{Of Whom}]_t [_S \text{did John see } [_{NP} \text{many } t]]]$
- d * $[\bar{S}[_{COMP} \text{What}]_t [_S \text{did John detest } [_{NP} \text{Harry's refusal to buy } t]]]$
- e * $[\bar{S}[_{COMP} \text{Who}]_t [_S \text{did John believe } [_{NP} \text{the claim } [\bar{S}(t) \text{ that } [_S \text{Harry saw } t]]]]]$
- f * $[\bar{S}[_{COMP} \text{Which class}]_t [_S \text{did } [_{NP} \text{everyone } [\bar{S}[_{COMP} t \text{ who } [_S \text{took } t]]] \text{ like the teacher}]]]$
- (ii)a * $[_S [_{NP} \text{Every city}]_t \text{ is likely } [\bar{S} \text{for } [_S [_{NP} \text{some men in } t] \text{ to enjoy jazz}]]]$
- b * $[_S [_{NP} \text{Some author's}]_t \text{ is likely } [\bar{S} \text{for } [_S [_{NP} t \text{ book} \text{ to be published}]]]]]$

- c * $[_S[_{NP}\text{The musicians}]_t \text{ seem } [_{\bar{S}}\text{for } [_S[_{NP}\text{many of } t] \text{ to play well}]]]$
- d * $[_S[_{NP}\text{The book}]_t \text{ is likely } [_{\bar{S}}\text{for } [_S[_{NP}\text{Harry's refusal to buy } t] \text{ to be a problem}]]]$
- e * $[_S[_{NP}\text{Bill}]_t \text{ is certain } [_{\bar{S}}\text{for } [_S[_{NP}\text{the claim } [_{\bar{S}}\text{that } [_S\text{Harry saw } t]]] \text{ to sway the jury}]]]$
- f * $[_S[_{NP}\text{Smith's class}]_t \text{ seems } [_{\bar{S}}\text{for } [_S[_{NP}\text{everyone } [_{\bar{S}}\text{who } [_S\text{took } t]]] \text{ to pass}]]]$

The examples in (i) and (ii) illustrate a range of complex nominal constructions from which neither wh-movement (in the former case), nor NP-movement (in the latter case) are possible. The (a) examples contain a PP-complement, the (b) examples a possessive NP, (c) a partitive, (d) a nominalization, (e) a noun complement and (f) a relative clause. All of the structures in (i) and (ii) violate the Subjacency Condition, since in each of them there are (at least) two bounding nodes, S and NP, intervening between either the wh-phrase (in (i)), or the NP (in (ii)), and the trace which it binds. Thus, the Subjacency Condition explains the impossibility of extracting a noun phrase from complex nominal constructions, on the assumption that for these rules, NP, as well as S, is a bounding node.

(Notice that if we were to hold that the range of possible wh-constructions is not limited (at least in part), by the Subjacency Condition, then it would no longer be possible to provide

a general explanation of the phenomena illustrated in (i). Indeed, examples like (i)a - (i)d, where a wh-phrase has been extracted from a noun phrase which does not contain an internal clause, are particularly recalcitrant to analysis in a theory rejecting the Subjacency Condition (or some equivalent analogue). One could perhaps attempt to account for the phenomena illustrated by these examples by assuming some version of the NP Constraint (Bach and Horn (1976) - but cf. Chomsky (1977a) for a discussion of problems with this constraint concerning Extraposition of PP), or the Absolute A/A Condition (Kayne (1975)), which by stipulation prohibits movement from a complex nominal construction. But, while this maneuver would account for the facts in (i) and (ii), it would be an unwelcome move, since it would now be necessary to stipulate ad hoc what is otherwise explained by the theory, i.e., by the Subjacency Condition.

(Also notice that if \bar{S} and not S were a bounding node, then it would also not be possible to explain the phenomena in (i)a - (i)d. This is because there would then only be a single bounding node, namely NP, intervening between the wh-phrase in COMP and the trace which it binds. For discussion of this matter, see Chomsky (1977a).)

The reason for NP, as well as S, being a bounding node for rules mapping from Deep to Surface Structure, may perhaps be a reflection of the fact that NP, as well as S, is a natural domain for the functioning of syntactic rules. For example, beside passive sentences like 'Rome was destroyed by Carthage', there are also passive nominals:

'Rome's destruction by Carthage'. In the case of QR, though, which maps from Surface Structure to Logical Form, NP is not a natural domain of functioning; QR is an adjunction to S, not NP. Thus, there would seem to be little basis for extending the bounding nodes for QR to include NP.

In order to account for the fact that, for the rules mapping from Deep to Surface Structure, (i.e., wh-movement and NP-movement), NP, as well as S, is a bounding node, we will reformulate the Subjacency Condition as in (iii), adding clause (3) to the formulation in fn. 1, above:

(iii) Subjacency Condition

A logical form with the structure

$$\dots X_t \dots [\alpha \dots [\beta \dots [\gamma t] \dots] \dots] \dots X_t \dots$$

(α, β bounding nodes), is ill-formed

where (1) X_t immediately binds t

(2) If $\alpha = \beta$, then α does not immediately dominate β

(3) If $X = [Q \bar{N}]$, then $\alpha, \beta \neq NP$

- 5 Notice that this ambiguity appears not only in sentences containing 'that' or 'for' complementizers, but also in \emptyset -complementizer constructions as well:

(i) [_SJohn believed [_S \emptyset [_S[_{NP}someone] to be at the door]]]

Besides having the unmarked, opaque interpretation, where 'some' is construed as having scope narrower than 'believe', (i) also has a transparent reading, where 'some' is construed as having scope wider than 'believe'.

That sentences like (i) are ambiguous has been disputed recently by Postal (1974a - pp. 222-5). He claims that sentences like (i) are unambiguous, having only a transparent reading. But, if this were the case, then (i) should be false in any situation where there is no person in particular whom John believes to be at the door. Clearly, though, (i) may be true under such circumstances, indicating that it has an opaque, as well as transparent, reading.

Notice that the fact that (i) is ambiguous shows that 'someone' in (i) cannot be the direct object of 'believe' in surface structure, as was originally suggested in Rosenbaum (1967), and has been argued for in Postal (1974a). Under this analysis, the surface structure of 'John believed someone to be at the door' is (ii):

$$(ii) \quad [S_i \text{ John believed } [_{NP} \text{ someone}] [\bar{S} [S_j \text{ to be at the door}]]]$$

In order to generate a structure which represents the opaque reading of this sentence from (ii), QR would have to adjoin the quantified noun phrase to S_j . This derives (iii):

$$(iii) \quad * [S_i \text{ John believes } \alpha [\bar{S} [S [\text{someone}]_{\alpha} [S_j \text{ to be at the door}]]]]$$

In (iii), the quantified phrase 'someone' has narrower scope than 'believe'. This structure, however, is not a well-formed logical form; it contains a variable ' α ', which is not c-commanded by the phrase which binds it, in violation of the Condition on Proper Binding. Under the assumption, then, that the noun phrase 'someone' is the surface object of 'believe', it is not possible to explain why sentences like these have an opaque interpretation.

From the surface structure (i), on the other hand, it is possible to generate a well-formed logical form representing the opaque reading by adjoining 'someone' to the complement S:

$$(iv) \quad [_S \text{John believes } [_{\bar{S}} \emptyset [_S [\text{someone}]_{\alpha} [_S^{\alpha} \text{to be at the door}]]]]]$$

In (iv), the variable ' α ' is properly bound, and thus, it is a well-formed structure.

For more discussion of the properties of \emptyset -complement constructions, see Chomsky (1973) and Chomsky and Lasnik (1977). For telling criticisms of Postal's arguments for a structure like (ii), see Bresnan (1976c).

- 6 The possibility of exportation is apparently not only dependent on the vividness of the embedded noun phrase, but also on the properties of other noun phrases contained in the sentence. For example, consider the sentences in (i):

- (i)a John confirmed that every investor was bankrupt
- b The stock market crash confirmed that every investor was bankrupt

There is a marked difference in the interpretation of these two sentences. While (i)a is ambiguous, (i)b is unambiguous, only having an interpretation where 'every' is construed as having narrower scope than the predicate 'confirmed'. Thus, these examples indicate that the nature of the entities denoted by the subject noun phrase, e.g., whether they are animate or inanimate, is a significant factor in determining whether a transparent reading, in addition to an opaque reading, is possible.

The semantic properties of other lexical items contained in matrix-complement constructions are also significant in determining the possibility of a transparent reading. For example, consider verbs of saying. While sentences simply containing the verb 'say', like (ii), are apparently ambiguous, changing the predicate to a

- (ii) John said that everyone had left

verb of this class which more physically describes the actual speech act, e.g., 'hiss' or 'mumble', precludes a transparent reading:

- (iii)a John hissed that everyone had left
- b John mumbled that everyone had left

The same semantic effect can be achieved by the addition of manner adverbs to sentences like (ii). Thus, like (iii), and unlike (ii), (iv) only has an opaque reading:

(iv) John said loudly that everyone had left

Other logical operators besides adverbs also prevent exportation; negation in many cases has the same effect, as can be seen by comparing (ii) with its negated counterpart (v):

(v) John didn't say that everyone had left

(Notice that the sort of circumstances just noted governing the possibility of transparency are striking in their resemblance to the bridge conditions on wh-movement, discussed in Erteschlick (1973). Thus, we find that those cases which do not permit transparent reading apparently also do not permit wh-movement: Compare the examples in (vi) to those in (3.1):

- (vi) a *What did Jones hiss that Smith liked?
- b *Who did John quote Bill as saying had left?
- c *What did Helen grieve had been experimented on?
- d *Who is it instructive to play the piece first?
- e *Which shuttlecocks did John ask whether he had
 bought at Abercrombie's
- f *How many people did Mark regret Sam's having
 invited?

Those cases which do permit a transparent reading, in contrast,

regularly permit wh-movement:

- (vii)a Who did John believe was at the door?
- b How many people does Harry want us to invite
 to the party?
- c Which picture did John realize had been stolen?
- d Who did John say had left?

The direct questions in (vii) are all unambiguous, in contrast to their ambiguous sources; they only have a transparent reading.

(vii)a, for example, is an inquiry into the identity of the specific individual whom John believed was at the door (cf. Chapter Two, fn. 8). These observations indicate that the conditions governing the possibility of transparency overlap with the bridge conditions on wh-extraction in these constructions.)

The possibility of a transparent reading is not governed solely by factors brought to bear by the particular lexical items, but also, like the marked interpretation of PP-complement constructions, by the depth of embedding of the quantified noun phrase. Thus, the sentences in (viii), in comparison to (3.11)a, are unambiguous; they each apparently have only an opaque reading:

- (viii)a The Duke realized that John believed that
 someone was at the door
- b Archie said that The Duke realized that John
 believed that someone was at the door

Thus, an opaque reading is always possible for full S-complement

constructions, regardless of how deeply embedded a quantified noun phrase is in surface structure. The possibility of transparency, though, decreases as the quantified noun phrase is more deeply embedded.

- 7 As in the case of the marked reading of PP-complement constructions (cf. Chapter Two, fn.18), it is not possible to account for the marked interpretation of matrix-complement constructions by a simple modification of the principles of core grammar. For instance, one might assume that the Subjacency Condition was not a principle of core grammar, allowing for the direct generation of a logical form in which a quantified phrase embedded in a complement clause has wide scope. Under this assumption, it would be possible to generate (i) as a well-formed logical form from the surface structure of 'John believed that someone was at the door':

$$(i) \quad [{}_S[\text{someone}]_{\alpha} [{}_S\text{John believed that } [{}_S\alpha \text{ was at the door}]]]$$

Even though (i) represents the appropriate scope relations, it is not a representation of the transparent reading of this sentence, since the variable ' α ' has not been exported. Thus, eliminating the Subjacency Condition would lead, in this case, not only to a theory with a lower level of explanatory adequacy (since it does not distinguish the unmarked from the marked cases), but to a theory which is at a lower level of descriptive adequacy as well.

This is because it allows for the generation of (i), which does not correspond to any interpretation of the sentence 'John believed that someone was at the door'.

- 8 It is generally the case that pronouns (which are not marked otherwise) may be construed as variables bound by antecedent quantifiers. For example, in (i), 'him' may be understood as a

- (i) Everyone expected that John would bring
him Chateau Palmer

variable bound by the quantifier 'every', which follows from its being within the scope of 'every' in (ii):

- (ii) $[_S[\text{everyone}]_\alpha [_S^\alpha \text{expected that John would}$
 $\text{bring } \alpha \text{ Chateau Palmer}]]$

It has been pointed out, originally in Geach (1962), that there are sentences, containing relative clauses, in which a quantifier is anaphorically related to a pronoun which is not literally within its scope, as in (iii):

- (iii) Everyone who owns a donkey likes it

Here, the scope of the quantifier 'a' is limited to the relative

clause. This phenomenon, though, is apparently a reflection of more general principles of anaphoric interpretation, since pronouns may be "bound" by quantifiers which do not occur in the same sentence, but occur elsewhere in the discourse:

- (iv) A: Everyone owns a donkey in this town
 B: Does he feed it hay or alfalfa?

Given the sort of anaphoric properties illustrated by (iv), the fact that the pronoun 'it' may be construed anaphorically in (iii) is not pertinent to the clause-bounded nature of quantification, in our sense.

- 9 There also appears to be a marked interpretation of relative clauses. For example, Geach (1962) has pointed out examples like those in (i):

- (i)a The woman who every Englishman loves best is the Queen
 b The woman who every Englishman loves best is his mother

In (i)a, the quantifier 'every' is construed as having narrow scope with respect to 'the', but in (i)b it may be construed as having wider scope. On this reading, (i)b asserts that for each Englishman, there is one (and only one) woman whom he loves best, and that woman is his mother. (Notice that a reading where 'every' has narrow scope is also possible in (i)b, for instance, when the pronoun 'his' is construed deictically, rather than anaphorically.) Partee (1975)

notices the same type of ambiguity in sentence (ii):

- (ii) Every man who loves a woman loses her

She states that "There appears to be one interpretation in which there is one woman such that every man who loves her loses her, and another reading on which every man who loves any woman loses whichever woman he loves." (p. 232). A parallel ambiguity seemingly also exists in examples like (iii) (pointed out by G. Ioup):

- (iii) A book which every prisoner left surprised
the warden

(iii) can seemingly be taken as asserting either (a) that for each prisoner, there is some book which he left, which surprised the warden, or (b) that there is some book which all of the prisoners left, and it surprised the warden.

Besides the unmarked reading, represented by a naturally linked logical form, these sentences apparently also have a reading in which the embedded quantifier is understood as having scope wider than the head quantifier. Insofar as this reading exists, it constitutes the marked interpretation of relative clauses, a representation of which is not directly generable by core grammar.

The property of the marked interpretation of relative clauses which is of central significance here is that it is essentially parallel to the unmarked interpretation of PP-complement construc-

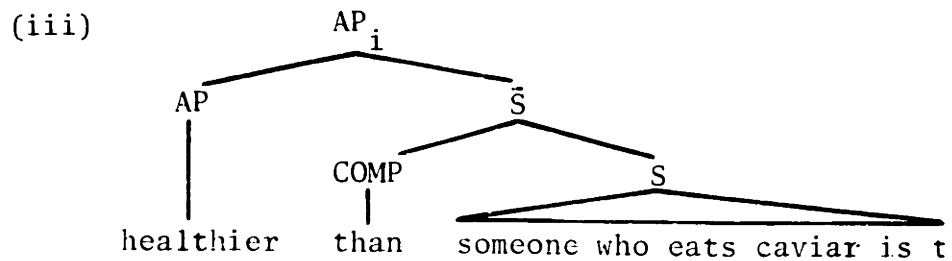
tions, discussed in Chapter Two. Thus, under the marked reading, the quantifiers in sentences like (i) - (iii), containing relative clauses, are construed as being inversely linked. With respect to markedness, then, relative clauses are the mirror image of PP-complement constructions: Relative clauses, on their marked interpretation, are construed as if they were PP-complements, while PP-complements, on their marked interpretation, are understood as if they were relative clauses. We briefly return to this relationship in Chapter Four.

- 10 There is one other construction in English which is associated with a linked logical form: the comparative construction. With respect to the scope possibilities of quantifiers the constructions are identical to relative clauses, in that a quantifier which is embedded in the compared clause is understood as having scope narrower than the head quantifier. This is illustrated by the examples in (i) and (ii):

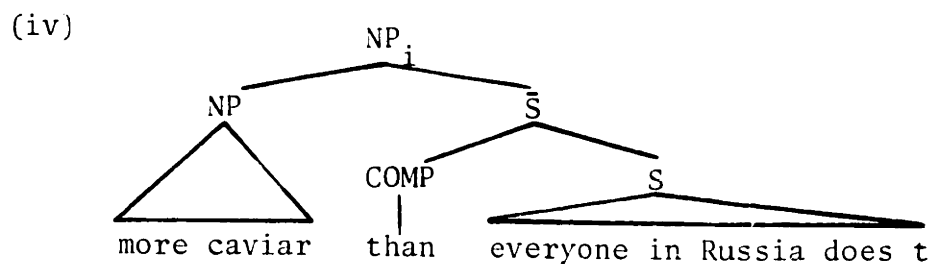
- (i) John is healthier than someone who eats caviar all day is.
- (ii) Smith eats more caviar yearly than everyone in Russia does in a decade.

This parallelism of comparative clauses and relative clauses follows immediately from the functioning of QR, since the structure of com-

paratives is essentially the same as the structure of relatives, except that adjectives (as well as nouns) may be compared, but not relativized. Thus, the structure of the comparative clause in (i) is (iii):



(We are assuming here, following Bresnan (1973), that the heads of comparative clauses are most fruitfully analyzed as containing quantifier elements, albeit of a complex nature.) The structure of (ii) is identical to (iv), except that NP's stand in place of the AP's, as in (iv):



Recall that the Condition on Analyzability, as formulated in Chapter One, determines that QR applies to a [+N]-phrase. Under the theory of linguistic categories developed originally in Chomsky (1970) (see also Jackendoff (1974)), the categories which

have the feature [+N] are noun phrases and adjective phrases. Thus, QR functions identically in comparative constructions like (iii) and (iv) as it does in relative clauses, affecting not only the quantifier embedded in the compared clauses, but also AP_i and NP_i in (iii) and (iv), respectively. This generates (v) and (vi) as the logical forms of (i) and (ii) (where -er is the head quantifier in (i)):

$$(v) \quad [{}_S[\text{healthier than } [{}_S\text{someone who eats caviar}]_\beta \\ [{}_S^\beta \text{ is } t]]]_\alpha [{}_S\text{John is } \beta]]$$

$$(vi) \quad [{}_S[\text{more caviar yearly than } [{}_S[\text{everyone in Russia}]_\beta \\ [{}_S^\beta \text{ does } t]]]_\alpha [{}_S\text{John eats } \alpha]]$$

Structurally, (v) and (vi) are identical to the logical form, (3.16), which is associated with relative clauses - i.e., they are naturally linked. Since relative clauses and comparative clauses are associated with logical forms which are, in the relevant respects, structurally identical, it follows that in comparatives like (i) and (ii), the quantifier in the embedded clause is construed as having narrower scope than the head quantifier, as is also the case in relative clauses.

- 11 Cf. footnote 9, where it is pointed out that both the unmarked interpretation of PP-complements and the marked interpretation of relative clauses are represented by inversely linked logical forms.

12 Following Chomsky and Lasnik (1977), we will hold that there is a rule of "Free Complementizer Deletion", which in the derivation of (3.29) deletes the complementizer 'for'. We assume that this rule is not a rule of sentence grammar, but rather a rule of phonological interpretation, applying to surface structures. Cf. Chomsky and Lasnik for discussion of the significance of this rule.

13 Notice that 'it' here is the expletive 'it', and not the pronominal 'it' occurring in sentences like (i):

(i)a John said that Harry bought it at the
hardware store

b Everyone who owns a donkey beats it

In (i)a, 'it' functions as a deictic pronoun, in (ii)a as a bound variable. In the sentences in (3.32), though, it serves neither of these functions; rather, it is a marker, so to speak, of indefinite reference.

14 We presume that 'it' in these structures is inserted by a lexicalization rule which replaces an unindexed empty node in surface structure by the formative 'it':

(i) $[_{NP}e] \rightarrow [_{NP}it]$

Parallel to free complementizer deletion discussed in fn. 12, we take 'it'-insertion to be a rule mapping from Surface Structure onto PI, the level of phonological interpretation. See Chomsky and Lasnik (1977), p. 448 ff., for discussion of the structural conditions governing the functioning of this rule.

- 15 In (3.34), as in (3.29), the complementizer 'for' is deleted by free complementizer deletion. Cf. fn. 12.
- 16 The analysis being presented here naturally explains the differences in interpretation in the pairs of sentences in (i) and (ii), pointed out in Ioup (1975):

- (i)a Everyone seems to admire the Duke of York
- b The Duke of York seems to be admired by everyone

- (ii)a Everyone is anxious to admire the Duke of York
- b The Duke of York is anxious to be admired by everyone

The sentences in (i) share an interpretation, in which the quantifier 'every' is construed as having scope narrower than the matrix predicate 'seem'. In (ii), on the other hand, the sentences do not share an interpretation. The reason for this becomes clear as soon as we notice that the sentence in (i) contains a raising predicate, those in (ii) an equi predicate. In the former case, as we have just seen, a quantifier which is the subject of the matrix predicate

may have scope narrower than that predicate, since the subject position of raising predicates is not an argument position. Therefore, both (i)a and (i)b are associated with logical forms in which the quantifier 'every' has narrow scope; in (i)b, this is a function of the fact that 'everyone' is an immediate constituent of the complement clause.

In the sentences in (ii), which contain the equi predicate 'be anxious', the subject quantified phrase cannot be adjoined to the complement S, since to do so would violate the Condition on Proper Binding. Thus, since in (ii)a 'everyone' is in the matrix clause, and in (ii)b in the complement clause, it follows that they do not share an interpretation, since quantification, in this case, is clause bounded.

- 17 For some discussion of the relationship of PRO and trace, see Lightfoot (1977).
- 18 It has been suggested that in addition to \bar{S} , NP may also constitute a relevant domain for these conditions. Cf. Chomsky (1977b) for discussion of this question, centering around the constituency of 'picture'-noun phrases. Notice that the issue of the nodes determining the domain of the Tensed-S and Specified Subject Conditions is independent of the issue of the bounding nodes which determine the domain of the Subjacency Condition. This is because the former conditions are not, in contrast to the Subjacency Condition, bounding

conditions; rather, they are general conditions determining the range of anaphoric possibilities for variables.

Chapter Four: PROLEGOMENA TO AN ANALYSIS OF THE MARKED CASES

In this thesis, we have examined the empirical consequences of the assumption that there exists a linguistic level of Logical Form, which we interpret as the interface between the theory of linguistic form and a more general theory of the semantics and pragmatics of natural languages. What we have shown is that those structures which are generable at this level by core grammar represent the unmarked interpretations of sentences containing quantified phrases. As we have proceeded, however, we have also noted the existence of "marked" cases, representations of which are not directly generable by core grammar. Among the marked cases have been the opaque interpretation of simple transitive constructions (Chapter One), the relative interpretation of sentences containing PP-complements (Chapter Two) and the transparent interpretation of matrix-complement constructions (Chapter Three). Empirically, these marked cases are characterized by an idiosyncratic dependence upon factors which manifestly lie beyond the expressive power of the theory of core grammar which has been developed here, (e.g., properties of particular lexical items, depth of embedding, the cognitive representations of a speaker of a given utterance of a sentence, etc.). In this concluding chapter, we wish to sketch a number of suggestions as to the nature of a more comprehensive theory of the form and interpretation of natural languages. These suggestions may ultimately lead to an account of the range of possible marked interpretations of quantified sentences.

The central claim of this thesis is that the existence of the

unmarked interpretations of a given construction is predictable, given our theory, solely from the constituency of surface structure, while the existence of the marked interpretations is not. In this respect, the structural properties of surface structure are, in themselves, inadequate to account for the marked cases. As an example for the sort of inadequacies we have in mind, consider for a moment the opaque reading of simple transitive constructions like (4.1):

(4.1) $[_S \text{Jones} [_{VP} \text{seeks} [_{NP} \text{a unicorn}]]]$

It has been suggested in a number of places (e.g., Quine (1960), sec. 32; Montague (1968)), that in order to account for the opaque interpretation of this construction, it is necessary to "build-up" structure in the object position of verbs like 'seek', 'want', etc. With regard to the particular case we are discussing, it has been held that 'seek' should be taken as meaning 'try to find'. In order to capture this, let us assume that there is a lexically dependent rule, outside of core grammar, which turns a structure like (4.1) into (4.2):

(4.2) $[_S \text{Jones} [_{VP} \text{tries} [_S \text{to find} [_{NP} \text{a unicorn}]]]]]$

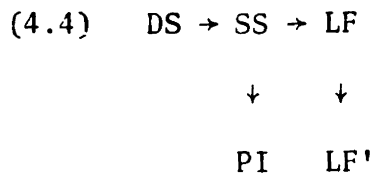
Given (4.2) we could now apply QR, generating (4.3):

(4.3) $[_S \text{Jones} [_{VP} \text{tries} [_S [\text{a unicorn}]_\alpha [_S \text{to find } \alpha]]]]]$

by adjoining the quantified phrase 'a unicorn' to the S node which arises from the operation mapping (4.1) onto (4.2). (4.3) is presumably a well-formed logical form (it satisfies the Condition on Proper Binding and the Subjacency Condition), which represents the marked, opaque interpretation of (4.1). However, there is a problem inherent in this account: $Q\bar{P}$, under our assumptions to this point, cannot apply to (4.2) in order to generate (4.3). This is because (4.2) is not a representation at any level of core grammar, specifically not at Surface Structure, since it is generated by a rule which is crucially dependent upon the nature of a particular lexical item, and hence is not a rule of core grammar. The issue which faces us, therefore, is to construct a general theory of linguistic form and interpretation which is expressively rich enough to account for the generation of (4.2) from (4.1). This more comprehensive theory must be wide enough to encompass, in the relevant respect, the sorts of idiosyncratic factors which we mentioned above as governing the occurrence of the marked interpretations. Furthermore, it must be wide enough to allow for the building up of structures from which may be determined the range of possible structures representing marked cases. This wider theory, then, contrasts with the theory of core grammar, which explains on the basis of surface structure constituency both the conditions under which the unmarked cases may occur, as well as their structure.

In order to bring to fruition the project just outlined, i.e., the construction of a theory of the marked cases of quantification, we would need at least another volume to fully weigh the syntactic and semantic issues which bear on the correct analysis. It is possible, however, to

very briefly sketch the sort of comprehensive theory we have in mind, and point out an example of the sort of results which follow from it. Recall that in Chapter One, we argued for the existence of a level of linguistic representation, distinct from Logical Form, at which both the marked and unmarked interpretations of sentences are represented. The rationale behind postulating the existence of this level, LF', was in order for a theory of meaning for natural language to be defined over a single level of linguistic representation. We have, therefore, been taking LF' to be an interpretive level of the grammar, parallel to other interpretive levels such as PI (phonological interpretation). Thus, the general structure of an overall theory of form and interpretation we are assuming is as in (4.4):



We assume that the general properties of these levels are determined by linguistic theory, and that Universal Grammar fixes formal parameters which specify the domain and nature of the rules mapping onto these interpretive levels. Given these basic assumptions, three closely inter-related questions pose themselves. First, what is the formal nature of representations at LF'?; second, what is the nature of the rules mapping onto this level?; and, third, what is the nature of the principles determining well-formedness at this level?

While providing full answers to these questions remains a topic of future research, it is possible to outline the sorts of answers we have in mind. In answer to the first question, we wish to hold that structures at LF' involve the standard logical representation of quantifier and variables, (as well as the logical connectives). Thus, as we noted in Chapter One, we are taking as the "converted forms" of logical forms such as those in (4.5), for example, to be something like the structure in (4.6):

(4.5)a $[_S[\text{every scale}]_\alpha [_S\text{Cecil played } \alpha]]$

b $[_S[\text{somebody}]_\alpha [_S^\alpha \text{ saw Dexter}]]$

(4.6)a $[_S\forall\alpha[_S[_S^\alpha \text{ is a scale}] \rightarrow [_S\text{Cecil played } \alpha]]]$

b $[_S\exists\alpha[_S[_S^\alpha \text{ is a person}] \& [_S^\alpha \text{ saw Dexter}]]]$

In order to answer the second question, we need note that the rules mapping onto LF' are not rules of core grammar, and therefore, are not subject to the narrow restrictions on expressibility imposed on possible transformational rules of core grammars. These rules mapping onto LF', therefore, may be stated in a richer formalism, whose formal parameters are wide enough to allow for the formulation of what we shall refer to as "conversion rules". Among the conversion rules we have in mind are rules of quantifier interpretation, which carry structures like (4.5)a and (4.5)b onto (4.6)a and (4.6)b, respectively, and rules of lexical conversion, which map structures like (4.1) onto (4.2). Presumably, the set of possible rules allowed under a formalism rich enough to allow the statement of conversion

rules will be a superset of the possible rules of core grammar. This feature of the theory we are outlining permits the formulation of rules mapping from LF onto LF' which are functionally identical to the rules of core grammar. Thus, we may assume that there exists a rule analogous to QR, which we shall refer to as QR', which maps from LF onto LF'. We have already observed an example of the functioning of QR' in the generation of (4.3) (which in turn is mapped by quantifier conversion rules into a representation in the notation of logical quantifiers and variables, as displayed in (4.6)). The major difference between QR and QR' (aside from the fact that the former maps from Surface Structure to Logical Form, and the latter from Logical Form to LF') is that there may be added conditions, aside from whether its structural description is satisfied, which govern the functioning of QR'. For example, QR' may be governed by the occurrence of particular lexical items, by properties of discourses, intonational properties of sentences, as well as extra-grammatical factors such as the beliefs, expectations and other cognitive representations of a speaker uttering a sentence.¹ (This aspect of the rules mapping from Logical Form onto LF' is a developement of suggestions in Chomsky (1975a), (1976).)

In answering the third question posed above, we minimally assume that analogues of the Predication Condition and the Condition on Quantifier Binding are also defined over representations at LF'.² This is quite a natural assumption to make, since the purpose of these conditions is to generally characterize those structures which are interpretable by the rules of quantifier interpretation for natural languages, which are defined

over representations at LF'.³

The answers we are proposing to these questions are by no means uncontroversial. For instance, it is not immediately clear that the use of unrestricted quantification assumed in (4.6) can serve generally to represent the converted forms of quantified sentences, in light of considerations of the role of presupposition in a semantics of natural language (cf. Soames (1976) for a discussion of this issue). It should be pointed out, however, that the question of the correct logical notation for representations at LF' is an empirical issue, the answer to which is intimately related to a wide range of issues in the semantics of natural language quantification. Apart from these considerations, however, there may also be arguments of a somewhat different nature bearing on the character of representations at LF', and hence on the rules which map onto, and the constraints defined over, that level. In particular, we wish to justify the assumptions outlined above by showing that on the basis of these assumptions it is possible to provide an account of the range of marked interpretations of sentences containing quantifiers. Insofar as this task can be carried out for a significant range of marked cases, it will provide evidence for the proper nature of representations over which interpretations of natural language quantified sentences are defined.

As an indication of the scope of the extended theory we are proposing, and some of the results which follow from it, consider the analysis of the marked interpretation of sentences containing PP-complement constructions. It was pointed out in Chapter Two that sentences like (4.7) are ambiguous;

- (4.7) Every senator on a key congressional committee
voted for the amendment

it has a reading in which the quantifiers are understood as inversely linked, and a reading which is parallel to the reading associated with (4.8):

- (4.8) Every senator who is on a key congressional
committee voted for the amendment

The generation of a representation at LF' of the former, unmarked reading of (4.7) is effected by applying the appropriate conversion rules to the logical form (4.9);

- (4.9) $[_S[a \text{ key congressional committee}]_{\alpha} [_S[\text{every senator on } \alpha]_{\beta} [_S^{\beta} \text{ voted for the amendment}]]]$

deriving essentially the converted form (4.10):

- (4.10) $[_S \exists! \alpha [_S [_S^{\alpha} \text{ is a key congressional committee}] \ \& \ [_S \forall \beta [_S [_S^{\beta} \text{ is a senator on } \alpha] \rightarrow [_S^{\beta} \text{ voted for the amendment}]]]]]$

In order to account for the derivation of a converted form representing the marked reading, it is important to notice that, since QR applies optionally, structures such as (4.11) may exist at Logical Form;

$$(4.11) \quad [_S[\text{every senator on } [_{NP}\text{a key congressional committee}]]_\beta \\ [_S\beta \text{ voted for the amendment}]]$$

(although it is not a well-formed representation at that level, since it violates the Condition on Quantifier Binding). Presumably though, this structure does satisfy the conversion rule turning 'every' into a universal quantifier. This would derive a structure along the lines of (4.12):

$$(4.12) \quad [_S\forall\beta[_S[_{S_i}\beta \text{ is a senator on } [_{NP}\text{a key congressional} \\ \text{committee}]] \rightarrow [_S\beta \text{ voted for the amendment}]]]$$

To this structure, given our extended assumptions concerning rules mapping onto LF', the rule of QR' may apply, adjoining the quantified noun phrase 'a key congressional committee' to S_i , (which is the S which arises from the functioning of the rule converting 'every'). This operation derives (4.13):⁴

$$(4.13) \quad [_S\forall\beta[_S[_S[\text{a key congressional committee}]_\alpha [_{S_i}\beta \text{ is a senator} \\ \text{on } \alpha]] \rightarrow [_S\beta \text{ voted for the amendment}]]]$$

To (4.13), the rule of quantifier conversion for 'a' applies, turning it into an existential quantifier in this context:⁵

$$(4.14) \quad [_S\forall\beta[_S[_S\exists\alpha[_S[_S\alpha \text{ is a key congressional committee}] \& \\ [_{S_i}\beta \text{ is a senator on } \alpha]]] \rightarrow [_S\beta \text{ voted for the} \\ \text{amendment}]]]$$

In the converted form (4.14), the existential quantifier corresponding to 'a' in (4.7) has scope narrower than the universal quantifier which corresponds to 'every'. This is in contrast to the converted form (4.10), which represents the unmarked interpretation of (4.7). In this latter structure the quantifier corresponding to 'a' has wider scope than the quantifier corresponding to 'every'. The relation between the marked interpretation represented by (4.14), and the reading of the relative clause construction (4.8), is highlighted by comparing (4.14) to (4.16), which is the converted form generated from the logical form (4.15):

$$(4.15) \quad [_S[\text{every senator who } [_S[\text{a key congressional committee}]_\alpha \\ [_S t \text{ is on } \alpha]]]_\beta [_S \beta \text{ voted for the amendment}]]$$

$$(4.16) \quad [_S \forall \beta [_S \beta \text{ is a senator}] \& [_S \exists \alpha [_S \alpha \text{ is a key congressional} \\ \text{committee}] \& [_S \beta \text{ is on } \alpha]]] \rightarrow [_S \beta \text{ voted for the} \\ \text{amendment}]]]$$

(Here, as above, we are assuming that in the generation of converted forms for relative clauses there is another conversion rule involved, which has the effect of rewriting a wh-word as a conjunction.) Notice that (4.16) is equivalent to (4.14), as the antecedent of the conditionals in each of these structures is true under the same condition; viz., if Proxmire is a senator and the Foreign Relations committee is a key congressional committee and Proxmire is on the Foreign Relations committee, then it is also the case that the Foreign Relations committee is a key congressional committee and Proxmire is a senator on the Foreign Relations Committee, and vice

versa. Thus, since the antecedents of the conditional are the only parts of these structures which differ, and since they are equivalent, it follows that (4.14) and (4.16) are themselves equivalent.

Given an analysis along these lines, then, it is possible to account for the fact that the marked interpretation of sentences containing PP-complements is essentially identical to the unmarked interpretation of sentences containing relative clauses. This is because the type of logical structures associated with these cases at LF' are equivalent. Indeed, insofar as the theory being proposed here can be sustained, (4.14) is the only well-formed structure at LF' which can be associated with (4.7), aside from (4.10), which represents the unmarked case, (cf. fn. 4). This is a significant result, since it means that it is possible to give a full explanation of the general properties of quantification in sentences containing PP-complement constructions; i.e., what constitutes the marked, as well as the unmarked case.

We are suggesting, therefore, that a general theory of linguistic form and interpretation may be developed which explains not only the range of possible unmarked interpretations, but also the range of possible marked interpretations of a given construction. While we have barely sketched the details of this theory, we have attempted to present a number of suggestive ideas as to the formal parameters demarcating the range of the theory. We have also pointed to some of the types of phenomena which follow from it. It remains for future research to clarify the full range of syntactic and semantic factors bearing on the ultimate empirical status of such theory.

FOOTNOTES

Chapter Four

- 1 It should be kept clear that our goal here is to point out some ideas bearing on the construction of a theory of the possible structures which may represent marked interpretations, an issue which is distinct from determining the circumstances under which a marked interpretation may occur in a particular sentence. Notice, that while some of the factors which determine the occurrence of a marked interpretation are more or less apparent (e.g., semantic properties of lexical items), it may well be the case that there are no general principles which predict all the conditions under which a marked case can occur. That is, the existence of a marked interpretation in a given sentence may be truly idiosyncratic, not merely to a given sentence, but perhaps even to utterances of that sentence (cf. section 3.3).
- 2 Assuming that c-command, (or some appropriate analogous notion), can be defined over representations at LF'.
- 3 We have not mentioned here the status of the Subjacency Condition in the extended theory we are developing. The central case which bears on its status is the transparent interpretation of matrix-complement constructions, and the exact nature of exportation in these constructions. If the effect of exportation is to "raise" a variable into a transparent position out of the complement clause, then the structures derived at

LF' representing the marked, transparent interpretation of matrix-complement constructions may indeed satisfy the Subjacency Condition. Thus, we could assume that the structure derived by exportation (and QR) is something like (i):

$$(i) \quad [{}_S[\text{someone}]_\alpha [{}_{S_i} \text{Ralph believes } \alpha [{}_S[\text{is a spy}]]]]$$

Here, there is only a single bounding node, S_i , intervening between ' α ', and the quantified phrase, 'someone', which (immediately) binds it. If an analysis along these lines turns out to be correct, we could then assume that the Subjacency Condition, (as well as the Predication Condition and The Condition on Proper Binding), is defined over representations at LF', in addition to being defined over representations at Logical Form.

- 4 Notice that the central property of the rules generating converted forms which is of concern to us here is that they have the effect of building-up sentential structure. The assumption that the structures generated by these rules involve the logical connectives, on the other hand, does not have this central significance. Indeed, representations of converted forms which do not involve the logical connectives, (say for reasons having to do with the presuppositions in universal quantifications), would be equally satisfactory for our purposes, as long as the rules generating these structures at LF' have the effect of building up the appropriate sort of sentential structure.

5 Notice that (4.10) and (4.14) are the only structures generable, under our extended assumptions, from structures at Logical Form, which are, in turn, generated from the surface structure of (4.7). (4.10) represents the conversion of the logical form in which QR has applied to both of the quantifiers; (4.14), is the converted form derivable from a structure to which QR has applied only to 'every'. Notice that the structure derivable from a structure in which QR has only applied to 'a' is identical to the converted form derived from a logical form in which QR has applied to both quantifiers. This is true because, in the derivation of a converted form from (i), QR' must apply:

$$(i) \quad [_S[a \text{ key congressional committee}]_{\alpha} [_S[_{NP} \text{every} \\ \text{senator on } \alpha] \text{ voted for the amendment}]]$$

If this rule were to apply the quantified phrase 'every senator on α ', deriving a structure in which it has wider scope than 'a key congressional committee', the result would not be well-formed, since it would violate the Condition on Proper Binding, viz., (ii):

$$(ii) \quad *[_S[\text{every senator on } \alpha]_{\beta} [_S[a \text{ key congressional} \\ \text{committee}]_{\alpha} [_S^{\beta} \text{ voted for the amendment}]]]$$

In order to generate a well-formed structure from (i), QR must adjoin the 'every'-phrase to S_i , generating from (iii):

(iii) $[_S[\text{a key congressional committee}]_\alpha [_S[\text{every senator on } \alpha]_\beta [_S^\beta \text{ voted for the amendment}]]]$

(iii), though, is identical to (4.9), whose converted form is (4.10).

What this shows, then, is that (4.10) and (4.14) are the only well-formed converted forms which can be associated with (4.7), given our extended assumptions. We comment on the significance of this result below.

BIBLIOGRAPHY

- Akmajian, A. (1975) "More Evidence for an NP Cycle", Linguistic Inquiry, 6.1.
- Akmajian, A. and F. Heny (1975) An Introduction to the Principles of Transformational Grammar, MIT Press, Cambridge, Mass.
- Akmajian, A. and A. Lehrer (1976) "NP-Like Quantifiers and the Problem of Determining the Head of an NP", Linguistic Analysis, 2.4.
- Akmajian, A., P. Culicover and T. Wasow, eds. (1977) Formal Syntax, Academic Press, New York.
- Andrews, A. (1975) Studies in the Syntax of Relative and Comparative Clauses, unpublished Doctoral dissertation, MIT, Cambridge, Mass.
- Bach, E. and G. Horn (1975) "Remarks on 'Conditions on Transformations'", Linguistic Inquiry, 7.2.
- Belnap, N (1963) An Analysis of Questions: Preliminary Report, System Development Corp., Santa Monica, Ca.
- Bowers, J. (1976) "On Surface Structure, Grammatical Relations and the Structure Preserving Hypothesis", Linguistic Analysis, 3.2.
- Bresnan, J. (1972) Theory of Complementation in English Syntax, unpublished Doctoral dissertation, MIT, Cambridge, Mass.
- _____ (1973) "Syntax of the Comparative Clause Construction in English", Linguistic Inquiry, 4.5.
- _____ (1976a) "On the Form and Function of Transformations", Linguistic Inquiry, 7.1.
- _____ (1976b) "Evidence for a Theory of Unbounded Transformations", Linguistic Analysis, 2.4.
- _____ (1976c) "Some Nonarguments for Raising", Linguistic Inquiry, 7.3.
- Chomsky, N. (1955) Logical Structure of Linguistic Theory, Plenum, New York, (1975).
- _____ (1962) "The Logical Basis of Linguistic Theory", Proceedings of the Ninth International Congress of Linguistics, Cambridge, Mass., 1962, Mouton, The Hague.

- Chomsky, N. (1964) Current Issues in Linguistic Theory, Mouton, The Hague.
- _____ (1968) Language and Mind, Harcourt, Brace and Javonovich, New York.
- _____ (1970) "Remarks on Nominalizations" in R. Jacobs and P. Rosenbaum, eds., Readings in Transformational Grammar, Ginn, Waltham, Mass. [reprinted in Chomsky (1972)].
- _____ (1972) Studies on Semantics in Generative Grammar, Mouton, The Hague.
- _____ (1973) "Conditions on Transformations" in S. Anderson and P. Kiparsky, eds., A Festschrift for Morris Halle, Holt, Reinhart and Winston, New York.
- _____ (1974) The Amherst Lectures, Documents Linguistiques, Université Paris VII.
- _____ (1975a) Reflections on Language, Pantheon, New York.
- _____ (1975b) "Questions of Form and Interpretation", Linguistic Analysis, 1.1.
- _____ (1976) "Conditions on Rules of Grammar", Linguistic Analysis, 2.4.
- _____ (1977a) "On Wh-Movement", in Akmajian, Culicover and Wasow, eds., (1977).
- _____ (1977b) "Introduction" to Essays in Form and Interpretation, North-Holland, New York.
- Chomsky, N. and H. Lasnik (1977) "Filters and Control", Linguistic Inquiry, 8.3.
- Cushing, S. (1976) The Formal Semantics of Quantification, unpublished : Doctoral dissertation, UCLA, Los Angeles, Ca.
- Dean, J. (1967) "Determiners and Relative Clauses", mimeographed paper, MIT, Cambridge, Mass.
- Emonds, J. (1976) A Transformational Approach to English Syntax, Academic Press, New York.
- Erteschick N. (1973) On the Nature of Island Constraints, unpublished Doctoral dissertation, MIT, Cambridge, Mass.
- Fiengo, R. (1974) Semantic Conditions on Surface Structure, unpublished Doctoral dissertation, MIT, Cambridge, Mass.

- Fiengo, R. (1977) "On Trace Theory", Linguistic Inquiry, 8.1.
- Fiengo, R. and H. Lasnik (1976) "Some Issues in the Theory of Transformations", Linguistic Inquiry, 7.1.
- Fitch, F. (1973) "Natural Deduction Rules for English", Philosophical Studies, 24: 89-104.
- Freidin, R. (1977) "Cyclicity and the Theory of Grammar, mimeographed paper, MIT, Cambridge, Mass.
- Gabbay, D. and J. Moravcsik (1974) "Branching Quantifiers, English and Montague Grammar", Theoretical Linguistics, 1.1.
- Geach, P. (1962) Reference and Generality, Cornell University Press, Ithaca, N.Y.
- Guéron, J. (1977) "A Semantic Filter for PP-Extrapolation", mimeographed paper, Université Paris VII.
- Hintikka, J. (1974) "Quantifiers vs. Quantification Theory", Linguistic Inquiry, 5.2.
- _____ (1975) "On the Limitations of Generative Grammar", Proceedings of the Scandinavian Seminar of Philosophy of Language, Nov. 8-9, 1974. Filosofiska forenigen, Uppsala, Sweden.
- _____ (1976) "Quantifiers in Logic and Quantifiers in Natural Language", in S. Korner, ed., Philosophy of Logic, University of California Press, Berkeley and Los Angeles.
- Hiž, H. (1962) "Questions and Answers", Journal of Philosophy, 59.
- Ioup, G. (1975) The Treatment of Quantifier Scope in Transformational Grammar, unpublished Doctoral dissertation, The Graduate Center, City University of New York.
- Jackendoff, R. (1968) "Quantifiers in English", Foundations of Language, 4.4.
- _____ (1971) "Gapping and Related Rules", Linguistic Inquiry, 2.1.
- _____ (1974) "Introduction to the \bar{X} -Convention", Indiana University Linguistics Club, Bloomington.
- _____ (1977) \bar{X} -Syntax: A Study of Phrase Structure, Linguistic Inquiry Monograph 2, MIT Press, Cambridge, Mass.
- Kasher, A. and D. Gabbay (1976) "On the Semantics and Pragmatics of Specific and Non-Specific Indefinite Expressions in English", Theoretical Linguistics, 2.3.

- Kayne, R. (1975) French Syntax: The Transformational Cycle, MIT Press, Cambridge, Mass.
- Kaplan, D. (1969) "Quantifying In", in D. Davidson and K.J.J. Hintikka, eds., Words and Objections, Reidel, Dordrecht.
- Koster, J. (1977a) "Why Subject Sentences Don't Exist", mimeographed paper, University of Amsterdam.
- _____ (1977b) "Remarks on Wh-Movement and the Locality Principle", mimeographed paper, University of Amsterdam.
- Kroch, A. (1974) The Semantics of Scope in English, unpublished Doctoral dissertation, MIT, Cambridge, Mass.
- Kuno, S. (1973) "Constraints on Internal Clauses and Sentential Subjects", Linguistic Inquiry, 4.3.
- Lakoff, G. (1971) "On Generative Semantics" in D. Steinberg and L. Jakobovits, eds., Semantics, Cambridge University Press, Cambridge.
- _____ (1972) "Linguistics and Natural Logic" in D. Davidson and G. Harman, eds., Semantics of Natural Language, Reidel, Dordrecht.
- Lasnik, H. and R. Fiengo (1974) "Complement Object Deletion", Linguistic Inquiry, 5.4
- Lasnik, H. and J. Kupin (1976) "A Restrictive Theory of Transformational Grammar", mimeographed paper, University of Connecticut, Storrs.
- Lees, R. (1963) The Grammar of English Nominalizations, Indiana University Press, Bloomington; Mouton, The Hague.
- Lightfoot, D. (1977) "On Traces and Conditions on Rules" in Akmajian, Culicover and Wasow, eds., (1977).
- Montague, R. (1968) "On the Nature of Certain Philosophical Entities", reprinted in R. Thomason, ed., Formal Philosophy: Selected Papers of Richard Montague, Yale University Press, New Haven, (1974).
- Partee, B.H. (1975) "Montague Grammar and Transformational Grammar", Linguistic Inquiry, 6.2.
- Peters, P.S. and R. Ritchie (1973) "On the Generative Power of Transformational Grammars", Information and Control, 6: 48-83.
- Postal, P. (1974a) On Raising, MIT Press, Cambridge, Mass.
- _____ (1974b) "On Certain Ambiguities", Linguistic Inquiry, 5.3.

- Postal, P. (1976) "On Avoiding Reference to Subject", Linguistic Inquiry, 7.1.
- Quicoli, A.C. (1977a) "Conditions on Quantifier Movement in French", Linguistic Inquiry, 7.4.
- _____ (1977b) "Conditions on Clitic Movement in Portuguese", Linguistic Analysis, 2.3.
- Quine, W.V.O. (1955) "Quantifiers and Propositional Attitudes", reprinted in The Ways of Paradox, Random House, New York (1966).
- _____ (1960) Word and Object, MIT Press, Cambridge, Mass.
- Reinhart, T. (1976) The Syntactic Domain of Anaphora, unpublished Doctoral dissertation, MIT, Cambridge, Mass.
- Rodman, R. (1976) "Scope Phenomena, 'Movement Transformations', and Relative Clauses", in B.H. Partee, ed., Montague Grammar, Academic Press, New York.
- Rosenbaum, P. (1967) The Grammar of English Predicate Complement Constructions, MIT Press, Cambridge, Mass.
- Ross, J.R. (1967) Constraints on Variables in Syntax, unpublished Doctoral dissertation, MIT, Cambridge, Mass.
- _____ (1974) "Three Batons for Cognitive Psychology" in D. Palermo and W. Weimer, eds., Cognition and the Symbolic Processes, Lawrence Erlbaum Associates, Hillsdale, N.J.
- Rouveret, A. (1977) "Result Clauses and Conditions on Rules", mimeographed paper, Université Paris VII.
- Sag, I. (1976) Deletion and Logical Form, unpublished Doctoral dissertation, MIT, Cambridge, Mass.
- Schacter, P. (1976) "A Nontransformational Account of Gerundive Nominals in English", Linguistic Inquiry, 7.2.
- Selkirk, W. (1970) "On the Determiner System of Noun Phrases and Adjective Phrases", mimeographed paper, MIT, Cambridge, Mass.
- _____ (1972) The Phrase Phonology of English and French, unpublished Doctoral dissertation, MIT, Cambridge, Mass.
- _____ (1977) "Some Remarks on Noun Phrase Structure", in Akmajian, Culicover and Wasow, eds., (1977).

- Siegel, D. (1974) Topics in English Morphology, unpublished Doctoral dissertation, MIT, Cambridge, Mass.
- Smith, C. (1964) "Determiners and Relative Clauses in a Generative Grammar of English" in D. Reibel and S. Schane, eds., Modern Studies in English, Prentice-Hall, Englewood Cliffs, N.J.
- Soames, S. (1976) A Critical Examination of Frege's Theory of Presupposition and Contemporary Alternatives, unpublished Doctoral dissertation, MIT, Cambridge, Mass.
- Van Reimsdijk, H. (1977) "On the Diagnosis of Wh-Movement" in J. Kegl, D. Nash and A. Zaenen, eds., Proceedings of the Seventh Annual Meeting of the North Eastern Linguistic Society, Cambridge, Mass.
- Van Reimsdijk, H. and F. Zwarts (1974) "Left-Dislocation in Dutch and the Status of Copying Rules", mimeographed paper, MIT and University of Amsterdam.
- Vergnaud, J.-R. (1974) French Relative Clauses, unpublished Doctoral dissertation, MIT, Cambridge, Mass.
- Wells, R. (1947) "Immediate Constituents", Language, 23: 81-117.
- Williams, E. (1974) Rule Ordering in Syntax, unpublished Doctoral dissertation, MIT, Cambridge, Mass.
- _____ (1977) "Discourse and Logical Form", Linguistic Inquiry, 8.1.
- Woisetschlaeger, E. (1976) "On How Useful a Construct the Left-Branch Condition Is", in A. Ford, J. Reighard and R. Singh, eds., NELS VI, Montreal Working Papers in Linguistics, 6 May 1976.